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Sam Hall BY POUL ANDERSON



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ASF—8—53

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"YOU KNOW WHAT I MEAN . . ."

I've had an opportunity to learn a little about a project now under way at the Harvard Computer Lab; the men engaged in it do not, probably, have the same opinions about it that I have formed. We'll find out later whether my hunches regarding it are valid.

I have a feeling the job now started will snowball for the next century or so—and that they have started on the most important basic project Man has ever tackled.

They're studying the problem of teaching a computing machine to translate English to Russian, and Russian to English.

It's my belief that, in the process, they will solve about ninety per cent of Mankind's social, psychological, economic and political problems. The computers won't solve the problems—but they'll force the men working on them to solve them.

Reason: You can NOT say to a computer "You know what I mean . . ." The computer would only reply, "No. Define 'you.' Define 'know.' Define 'I.' Define 'mean.' Op-

eration-relational processes regarding these terms not available."

All right, friend—go ahead. Define "I." Define it in terms of function and relationship to the Universe. Define it in terms of characteristics of process and program the steps the computer is to take in interacting this concept "I" with the operational program steps meant by the concept "know." Just do that one, single little thing, just define that one pair of terms—and you'll resolve about seventy-five per cent of all human problems.

Korzybski was a piker. He tried to teach human beings, who have built-in automatic self-programming units. They may not be perfect, but they work with incredible efficiency.

Try teaching a computing machine what you mean by some nice, simple term like "food." There's a good, basic, simple idea—an item basic to the most elementary understandings of life processes, politics, sociology, psychology and economics. This is one that must be included, obviously.

Anthony Oettinger, one of the men

working on the project, explained part of the problem very neatly and completely by telling of one phase of the difficulty. Suppose we take a common English saying, and translate it into Chinese. Now if translation were perfect, we should be able to retranslate to English and recover the original phrase. Actually, in one instance, the retranslation yields "invisible idiot." Guess what went in originally! It's a perfectly understandable result; after all, something that is invisible, is out of sight—and an idiot is one who is out of mind. It could equally have come out "hidden maniac" or "distant madman."

Translation cannot be done on a word basis; we don't use words, actually, but concepts. Translating word-by-word would be only slightly more rewarding than transliterating letter by letter. The Russian alphabet is different from ours; that doesn't mean that transliterating yields English. Neither does a word-for-word substitution, save in the simplest level of statement.

The Chinese-English saying translation above indicates the real difficulty — and one that General Semantics hasn't adequately recognized, I feel. Actually, in communicating with each other, we seek to communicate *concepts*; concepts are complex structures of many individual parts assembled in a precise relationship. If someone asked a chemist for sugar, and the chemist delivered a pile of carbon and two small flasks of hy-

drogen and oxygen—everything necessary for sugar is present, but it's not sugar.

Let's consider "food" a moment. Presumably we are seeking to achieve sane translations of sane human thinking from our computer. Under these conditions should we teach the machine to consider that human flesh is to be considered "food"?

Yes. A sane man must realize that his flesh is food—otherwise he would make the mistake of swimming in shark-infested waters, or ignore lions and other major carnivora.

Is wood "food"?

Yes; an engineer must realize that fact when he considers constructing buildings. Otherwise he would neglect the possibilities of termite damage.

Is steel "food"?

We must so instruct the computer; otherwise it could not translate "We must have steel scrap to feed our hungry furnaces."

Very well, gentlemen, what *do* you mean when you consider the concepts in "foods," "feed," and "eat"? *Define your terms!*

The sociologists and psychologists have long maintained that mathematical methods are not applicable to human problems. Not until the terms in which human problems are discussed have been defined operationally, certainly.

Teaching a computing machine, a machine that will invariably do precisely, but only, what you did-in-fact

"YOU KNOW WHAT I MEAN . . ."

instruct it to do will be a most humbling task. In the course of doing that job, I foresee the collapse of every human philosophy, the harsh winnowing of every human falsity, every slightest quibble, self-justification, or rationalization.

When a man is seeking to induce another man to agree with him, to learn his ideas, he can hold "he is stubborn; he refuses to understand me because he hates me." Or "He is too stupid to learn!"

When a man seeks to teach a computer . . .

Computers are not stubborn. If it is stupid, it is the failure of the man to perfect his handiwork, and the failure reflects inescapably to its source in Man. If it acts in a foggy, confused manner—Man made the mistake, and he must correct it. It's his mistake; responsibility cannot be assigned elsewhere.

Man, in trying to teach his tender and precious beliefs to a computing machine, is inviting the most appallingly frank and inescapable criticism conceivable. The computing machines won't solve human problems for us—but they'll force men to a degree of rigid self-honesty and humility that never existed before.

I can imagine some philosopher, some psychologist, or some physicist coming spluttering to the computer lab, demanding that the nonsensical answers so blatantly in disregard of the facts-as-he-believes them be corrected. "Out

of the way; let someone who knows something about this field teach this machine a few realities!"

Three weeks later, a haggard and vastly humbled man would come out, his fine structure of beliefs in tatters—and possessed of a realization of his own need to learn a few *real* realities.

I have heard psychologists use the term "ego," the terms "id" and "identity." I've looked, with some interest, in an Encyclopedia of Psychology; there is no entry under any one of those terms, no effort, even, to define them.

Have you ever sought a definition of "distance" as used in physics? It's one of the three fundamentals of the CGS system—and has no definition whatever. *Define your terms*, the computer relentlessly demands. The mathematician has no definition for "quantity" or "distance" either. Cantor has proved mathematically that any line segment has as many points—aleph null—as any other line, however long or short, or as any plane. Then define what you mean by "greater than" or "less than"! Until you do, the whole structure rests on "You know what I mean . . ."

The computer does *not* "know what you mean." Define it!

A while back I ran a faulty "syllogism" going, essentially, "Biology holds no organism can live in a medium of its own products. Communism holds a man has a right to what he

Continued on Page 161



SAM HALL

BY POUL ANDERSON

A revolution takes planning, organization, careful detail work. And the more organized the force to be overthrown, the more organization it takes. But it takes something more than that; it needs the fire and the lift of a Legend!

Illustrated by Stockwell

Click. Bzzz. Whrrrr.

Citizen Blank Blank, Anytown, Somewhere, U. S. A., approaches the hotel desk. "Single, with bath."

"Sorry, sir, our fuel ration doesn't permit individual baths. One can be drawn for you; that will be twenty-five dollars extra."

"Oh, is that all? O.K."

Citizen Blank reaches into his pocket with an automatic gesture and withdraws his punched card and gives it to the registry machine. Aluminum jaws close on it, copper teeth feel for the holes, electronic tongue tastes the life of Citizen Blank.

Place and date of birth. Parents. Race. Religion. Educational, military, and civilian-service record. Marital status. Occupations, up to and including current one. Affiliations. Phys-

ical measurements, fingerprints, retinals, blood type. Basic psychotype. Loyalty rating. Loyalty index as a function of time to moment of last checkup. *Click, click. Bzzz.*

"Why are you here, sir?"

"Salesman. I expect to be in New Pittsburgh tomorrow night."

The clerk—thirty-two years old, married, two children; N.B., confidential; Jewish; to be kept out of key occupations—punches the buttons.

Click, click. The machine returns the card. Citizen Blank puts it back in his wallet.

"Front!"

The bellboy—nineteen years old, unmarried; NB, confidential; Catholic; to be kept out of key occupations—takes the guest's trunk. The elevator creaks upstairs. The clerk resumes his reading. The article is entitled "Has Britain Betrayed Us?" Other articles in the magazine include "New Indoctrination Program for the Armed Forces," "Labor Hunting on Mars," "I Was a Union Man for the Security Police," "New Plans for YOUR Future."

The machine talks to itself. *Click, click.* A tube winks at its neighbor as if they shared a private joke. The total signal goes out over the wires.

With a thousand other signals, it shoots down the last cable and into the sorter unit of Central Records. *Click, click, Bzzz. Whrrr.* Wink and glow. A scanner sweeps through the memory circuits. The distorted mole-

cules of one spool show the pattern of Citizen Blank Blank and this is sent back. It enters the comparison unit, to which the incoming signal corresponding to Citizen Blank Blank has also been shunted. The two are perfectly in phase; nothing wrong. Citizen Blank Blank is staying in the town where, last night, he said he would, so he has not had to file a correction.

The new information is added to the record of Citizen Blank Blank. The whole of his life returns to the memory bank. It is wiped from the scanner and comparison units, so that these may be free for the next arriving signal.

The machine has swallowed and digested another day. It is content.

Thornberg came into his office at the usual time. His secretary glanced up to say, "Good morning," and looked closer. She had been with him for enough years to read the nuances in his carefully controlled face. "Anything wrong, chief?"

"No." He spoke it harshly, which was also peculiar. "No, nothing wrong. I feel a bit under the weather, maybe."

"Oh." The secretary nodded. You learned discretion in the government. "Well, I hope you get better soon."

"Thanks. It's nothing." Thornberg limped over to his desk, sat down, and took out a pack of cigarettes. He held one for a moment in nicotine-yellowed fingers before lighting it, and there

was an emptiness in his eyes. Then he puffed ferociously and turned to his mail. As chief technician of Central Records, he got a generous tobacco ration, and used all of it.

The office was not large—a windowless cubicle, furnished with gaunt orderliness, its only decoration a picture of his son and one of his late wife. Thornberg seemed too big for it. He was tall and lean, with thin straight features and neatly brushed graying hair. He wore a plain version of the Security uniform, with his insignia of Technical Division and major's rank but no other decoration, none of the ribbons to which he was entitled. The priesthood of Matilda the Machine were a pretty informal lot for these days.

He chain-smoked his way through the mail. Routine stuff, most of it having to do with the necessary changeovers for installing the new identification system. "Come on, June," he said to his secretary. Irrationally, he preferred dictating to her rather than a recorder. "Let's get this out of the way fast. I've got work to do."

He held one letter before him. "To Senator E. W. Harmison, S.O.B., New Washington. Dear Sir: In re your communication of the 14th inst., requesting my personal opinion of the new ID system, may I say that it is not a technician's business to express opinions. The directive ordering that every citizen shall have one number applying to all his papers and func-

tions—birth certificate, education, rations, social security, service, et cetera—has obvious long-range advantages, but naturally entails a good deal of work in reconverting all our electronic records. The President having decided that the gain in the long run justifies the present difficulties, it behooves all citizens to obey. Yours, and so forth." He smiled with a certain coldness. "There, that'll fix *him*! I don't know what good Congress is anyway, except to plague honest bureaucrats."

Privately, June decided to modify the letter. Maybe a senator was only a rubber stamp, but you couldn't brush him off so curtly. It is part of a secretary's job to keep the boss out of trouble.

"O.K., let's get to the next," said Thornberg. "To Colonel M. R. Hubert, Director of Liaison Division, Central Records Agency, Security Police, et cetera. Dear Sir: In re your memorandum of the 14th inst., requiring a definite date for completion of the ID conversion, may I respectfully state that it is impossible for me honestly to set one. It is necessary for us to develop a memory-modification unit which will make the change-over in all our records without our having to take out and alter each of the three hundred million or so spools in the machine. You realize that one cannot predict the exact time needed to complete such a project. However, research is progress-

ing satisfactorily (refer him to my last report, will you?), and I can confidently say that conversion will be finished and all citizens notified of their numbers within two months at the latest. Respectfully, and so on. Put that in a nice form, June."

She nodded. Thornberg went on through his mail, throwing most of it into the basket for her to answer alone. When he was done, he yawned and lit another cigarette. "Praise Allah that's over. Now I can get down to the lab."

"You have some afternoon appointments," she reminded him.

"I'll be back after lunch. See you." He got up and went out of the office.

Down an escalator to a still lower subterranean level, along a corridor, returning the salutes of passing technicians without thinking about it. His face was immobile, and perhaps only the stiff swinging of his arms said anything.

Jimmy, he thought. Jimmy, kid.

He entered the guard chamber, pressing hand and eye to the scanners in the farther door. Finger and retinal patterns were his pass; no alarm sounded; the door opened for him and he walked into the temple of Matilda.

She crouched hugely before him, tier upon tier of control panels, instruments, blinking lights, like an Aztec pyramid. The gods murmured within her and winked red eyes at the tiny men who crawled over her

monstrous flanks. Thornberg stood for a moment regarding the spectacle. Then he smiled, a tired smile creasing his face along one side. A sardonic memory came back to him, bootlegged stuff from the '40s and '50s of the last century which he had read, French, German, British, Italian. The intellectuals had been all hot and bothered about the Americanization of Europe, the crumbling of old culture before the mechanized barbarism of soft drinks, advertising, chrome-plated automobiles—dollar grins, the Danes had called them—chewing gum, plastics. . . . None of them had protested the simultaneous Europeanization of America: government control, a military caste, light-years of bureaucratic records and red tape, censors, secret police, nationalism and racialism.

Oh, well.

But Jimmy, boy, where are you now, what are they doing to you?

Thornberg went over to the bench where his best engineer, Rodney, was testing a unit. "How's it coming?" he asked.

"Pretty good, chief," said Rodney. He didn't bother to salute; Thornberg had, in fact, forbidden it in the labs as a waste of time. "A few bugs yet, but we're getting them out."

You had to have a gimmick which would change numbers without altering anything else. Not too easy a task, when the memory banks depended on individual magnetic domains. "O.K.,"

said Thornberg. "Look, I'm going up to the main controls. Going to run a few tests myself—some of the tubes have been acting funny over in Section Thirteen."

"Want an assistant?"

"No, thanks. I just want not to be bothered."

Thornberg resumed his way across the floor, its hardness echoed dully under his shoes. The main controls were in a special armored booth nestling against the great pyramid, and he had to be scanned again before the door opened for him. Not many were allowed in here. The complete archives of the nation were too valuable to take chances with.

Thornberg's loyalty rating was AAB-2—not absolutely perfect, but the best available among men of his professional caliber. His last drugged checkup had revealed certain doubts and reservations about government policy, but there was no question of disobedience. *Prima facie*, he was certainly bound to be loyal. He had served with distinction in the war against Brazil, losing a leg in action; his wife had been killed in the abortive Chinese rocket raids ten years ago; his son was a rising young Space Guard officer on Venus. He had read and listened to forbidden stuff, black-listed books, underground and foreign propaganda, but then every intellectual dabbled with that; it was not a serious offense if your record was otherwise good and if you laughed off

what the prohibited things said.

He sat for a moment regarding the control board inside the booth. Its complexity would have baffled most engineers, but he had been with Matilda so long that he didn't even need the reference tables.

Well—

It took nerve, this. A hypnoquiz was sure to reveal what he was about to do. But such raids were, necessarily, in a random pattern; it was unlikely that he would be called up again for years, especially with his rating. By the time he was found out, Jack should have risen far enough in the Guard ranks to be safe.

In the privacy of the booth, Thornberg permitted himself a harsh grin. "This," he murmured to the machine, "will hurt me worse than it does you."

He began punching buttons.

There were circuits installed which could alter the records—take an entire one out and write whatever was desired in the magnetic fields. Thornberg had done the job a few times for high officials. Now he was doing it for himself.

Jimmy Obrenowicz, son of his second cousin, hustled off at night by Security police on suspicion of treason. The records showed what no private citizen was supposed to know: Jimmy was in Camp Fieldstone. Those who returned from there were very quiet and said nothing about where they had been; sometimes they

were incapable of speech.

It wouldn't do for the chief of Central Records to have a relative in Fieldstone. Thornberg punched buttons for half an hour, erasing, changing. It was a tough job—he had to go back several generations, altering lines of descent. But when he was through, Jimmy Obrenowicz was no relation whatsoever to the Thornbergs.

And I thought the world of that kid. But I'm not doing it for myself, Jimmy. It's for Jack. When the cops go through your file, later today no doubt, I can't let them find out you're related to Captain Thornberg on Venus and a friend of his father.

He slapped the switch which returned the spool to its place in the memory bank. *With this act do I disown thee.*

After that he sat for a while, relishing the quiet of the booth and the clean impersonality of the instruments. He didn't even want to smoke.

So now they were going to give every citizen a number, tattooed on him no doubt. One number for everything. Thornberg foresaw popular slang referring to the numbers as "brands," and Security cracking down on those who used the term. Disloyal language.

Well, the underground was dangerous. It was supported by foreign countries who didn't like an American-dominated world—at least, not one dominated by today's kind of Amer-

ica, though once U.S.A. had meant "Hope." The rebels were said to have their own base out in space somewhere, and to have honeycombed the country with their agents. It could be. Their propaganda was subtle—we don't want to overthrow the nation, we only want to liberate it, we want to restore the Bill of Rights. It could attract a lot of unstable souls. But Security's spy hunt was bound to drag in any number of citizens who had never meditated treason. Like Jimmy—or had Jimmy been an undergrounder after all? You never knew. Nobody ever told you.

There was a sour taste in Thornberg's mouth. He grimaced. A line of a song came back to him: "*I hate you one and all.*" How had it gone? They used to sing it in his college days. Something about a very bitter character who'd committed a murder.

Oh, yes. "Sam Hall." How did it go, now? You needed a gravelly bass to sing it properly.

"Oh, my name is Samuel Hall, Samuel Hall.

Yes, my name is Samuel Hall, Samuel Hall.

*Oh, my name is Samuel Hall,
And I hate you one and all,*

You're a gang of muckers all, damn your hide."

That was it. And Sam Hall was about to swing for murder. He remembered now. He felt like Sam Hall himself. He looked at the machine and wondered how many Sam Halls were

in its memory banks.

Idly, postponing his return to work, he punched for the file—name, Samuel Hall, no other specifications. The machine mumbled to itself. Presently it spewed out a file of papers, micro-printed on the spot from the memory banks. Complete dossier on every Sam Hall, living and dead, from the time the records began to be kept. Thornberg chucked the papers down the incinerator slot.

"Oh, I killed a man, they say, so they say—"

The impulse was blinding in its savagery. They were dealing with Jimmy at this moment, probably pounding him over the kidneys, and he, Thornberg, sat here waiting for the cops to requisition Jimmy's file, and there was nothing he could do. His hands were empty.

No, he thought, I'll give them Sam Hall!

His fingers began to race, he lost his nausea in the intricate technical problem. Slipping a fake spool into Matilda—it wasn't easy. You couldn't duplicate numbers, and every citizen had a lot of them. You had to account for every day of his life.

Well, some of that could be simplified. The machine had only existed for twenty-five years, before then the files had been kept on paper in a dozen different offices. Let's make Sam Hall a resident of New York, his dossier there lost in the bombing thirty years

ago—such of his papers as were on file in New Washington had also been lost, in the Chinese attack. That meant he simply reported as much detail as he could remember, which needn't be a lot.

Let's see. "Sam Hall" was an English song, so Sam Hall should be British himself. Came over with his parents, oh, thirty-eight years ago, when he was only three, and naturalized with them; that was before the total ban on immigration. Grew up on New York's lower East Side, a tough kid, a slum kid. School records lost in the bombing, but he claimed to have gone through the tenth grade. No living relatives. No family. No definite occupation, just a series of unskilled jobs. Loyalty rating BBA-O, which meant that purely routine questions showed him to have no political opinions at all that mattered.

Too colorless. Give him some violence in his background. Thornberg punched for information on New York police stations and civilian-police officers destroyed in the last raids. He used them as the source of records that Sam Hall had been continually in trouble—drunkenness, disorderly conduct, brawls, a suspicion of hold-ups and burglary but not strong enough to warrant calling in Security's hypnotechnicians for quizzing him.

Hm-m-m. Better make him 4-F, no military service. Reason? Well, a slight drug addiction; men weren't so badly needed nowadays that hopheads

had to be cured. Neocoke—that didn't impair the faculties too much, indeed the addict was abnormally fast and strong under the influence, though there was a tough reaction afterwards.

Then he would have had to put in a term in civilian service. Let's see. He spent his three years as a common laborer on the Colorado Dam project; so many men had been involved there that no one would remember him, or at least it would be hard finding a supervisor who did.

Now to fill in. Thornberg used a number of automatic machines to help him. Every day had to be accounted for, in twenty-five years; but of course the majority would show no travel or change of residence. Thornberg punched for cheap hotels housing many at a time—no record would be kept there, everything being filed in Matilda, and no one would remember a shabby individual patron. Sam Hall's present address was given as the Triton, a glorified flophouse on the East Side, not far from the craters. At present unemployed, doubtless living off past savings. Oh, blast! It was necessary to file income tax returns. Thornberg did so.

Hm-m-m—physical ID. Make him of average height, stocky, black-haired and black-eyed, a bent nose and a scar on his forehead—tough-looking, but not enough so to make him especially memorable. Thornberg filled in the precise measurements. It wasn't hard to fake fingerprint and retinal

patterns; he threw in a censor circuit so he wouldn't accidentally duplicate anyone else.

When he was done, Thornberg leaned back and sighed. There were plenty of holes yet in the record, but he could fill them at his leisure. It had been a couple of hours' hard, concentrated work—utterly pointless, except that he had blown off steam. He felt a lot better.

He glanced at his watch. *Time to get back on the job, son.* For a rebellious moment he wished no one had ever invented clocks. They had made possible the science he loved, but they had then proceeded to mechanize man. Oh, well, too late now. He got up and went out of the booth. The door closed itself behind him.

It was about a month later that Sam Hall committed his first murder.

The night before, Thornberg had been at home. His rank entitled him to good housing even if he did live alone—two rooms and bath on the ninety-eighth floor of a unit in town, not far from the camouflaged entrance to Matilda's underground domain. The fact that he was in Security, even if he didn't belong to the man-hunting branch, gave him so much added deference that he often felt lonely.

He had been looking through his bookshelves for something to read. The Literary Bureau had lately been trumpeting Whitman as an early ex-

ample of Americanism, but though Thornberg had always liked the poet, his hands strayed perversely to the dog-eared volume of Marlowe. Was that escapism? The L.B. was very down on escapism. Oh, well, these were tough times. It wasn't easy to belong to the nation which was enforcing peace on a sullen world—you had to be realistic and energetic and all the rest, no doubt.

The phone buzzed. He went over and clicked the receiver on. Martha Obrenowicz's plain plump face showed in the screen, her gray hair was wild and her voice was a harsh croak.

"Uh . . . hello," he said uneasily. He hadn't called her since the news of her son's arrest. "How are you?"

"Jimmy is dead," she told him.

He stood for a long while. His skull felt hollow.

"I got word today that he died in camp," said Martha. "I thought you'd want to know."

Thornberg shook his head, back and forth, very slowly. "That isn't news I ever wanted, Martha," he said.

"It isn't *right!*" she shrieked. "Jimmy wasn't a traitor. I knew my own son. Who ought to know him better? He had some friends I was kind of doubtful of, but Jimmy, he wouldn't ever—"

Something cold formed in Thornberg's breast. You never knew when calls were being tapped.

"I'm sorry, Martha," he said with-

out tone. "But the police are very careful about these things. They wouldn't act till they were sure. Justice is one of our traditions."

She looked at him for a long time. Her eyes held a hard glitter. "You, too," she said at last.

"Be careful, Martha," he warned her. "I know it's a blow to you, but don't say anything you might regret later. After all, Jimmy may have died accidentally. Those things happen."

"I . . . forgot," she said jerkily. "You . . . are . . . in Security . . . yourself."

"Be calm," he said. "Think of it as a sacrifice for the national interest."

She switched off on him. He knew she wouldn't call him again. And it wouldn't be safe to see her.

"Good-by, Martha," he said aloud. It was like a stranger speaking.

He turned back to the bookshelf. *Not for me*, he told himself thinly. *For Jack*. He touched the binding of "Leaves of Grass." *O Whitman, old rebel*, he thought, with a curious dry laughter in him, *are they calling you Whirling Walt now?*

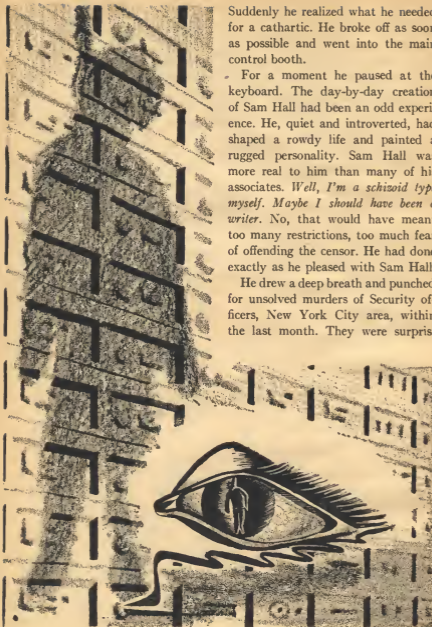
That night he took an extra sleeping pill. His head still felt fuzzy when he reported for work, and after a while he gave up trying to answer the mail and went down to the lab.

While he was engaged with Rodney, and making a poor job of understanding the technical problem under discussion, his eyes strayed to Matilda.

Suddenly he realized what he needed for a cathartic. He broke off as soon as possible and went into the main control booth.

For a moment he paused at the keyboard. The day-by-day creation of Sam Hall had been an odd experience. He, quiet and introverted, had shaped a rowdy life and painted a rugged personality. Sam Hall was more real to him than many of his associates. *Well, I'm a schizoid type myself. Maybe I should have been a writer.* No, that would have meant too many restrictions, too much fear of offending the censor. He had done exactly as he pleased with Sam Hall.

He drew a deep breath and punched for unsolved murders of Security officers, New York City area, within the last month. They were surpris-



ingly common. Could it be that dissatisfaction was more general than the government admitted? But when the bulk of a nation harbors thoughts labeled treasonous, does the label still apply?

He found what he wanted. Sergeant Brady had incautiously entered the Crater district after dark on the twenty-seventh of last month, on a routine checkup mission; he had worn the black uniform, presumably to give himself the full weight of authority. The next morning he had been found in an alley with his head bashed in.

*"Oh, I killed a man, 'tis said, 'tis said,
Yes, I killed a man, 'tis said, 'tis said.*

I beat him on the head

And I left him there for dead,

*Yes, I left him there for dead, damn
his hide."*

Newspapers had, no doubt, deplored this brutality perpetrated by the traitorous agents of enemy powers. (*Oh, the parson, he did come, he did come.*) A number of suspects had been rounded up at once and given a stiff quizzing. (*And the sheriff, he came too, he came too.*) There had been nothing proven as yet, though one Andy Nikolsky—fifth generation American, mechanic, married, four children, underground pamphlets found in his room—had been arrested yesterday on suspicion.

Thornberg sighed. He knew enough of Security methods to be sure they would get somebody for such a killing.

They couldn't allow their reputation for infallibility to be smirched by a lack of conclusive evidence. Maybe Nikolsky had done the crime—he couldn't *prove* he had simply been out for a walk that evening—and maybe he hadn't. But hell's fire, why not give him a break? He had four kids.

Thornberg scratched his head. This had to be done carefully. Let's see. Brady's body would have been cremated by now, but of course there had been a careful study first. Thornberg withdrew the dead man's file from the machine and microprinted a replica of the evidence—nothing. Erasing that, he inserted the statement that a blurred thumbprint had been found on the victim's collar and referred to ID labs for reconstruction. In the ID file he inserted the report of such a job, finished only yesterday due to a great press of work. (True enough—they had been busy lately on material sent from Mars, seized in a raid on a rebel meeting place.) The probable pattern of the whorls was—and here he inserted Sam Hall's right thumb.

He returned the spools and leaned back in his chair. It was risky; if anyone thought to check with the ID lab, he was done for. But that was unlikely, the chances were that New York would accept the findings with a routine acknowledgment which some clerk at the lab would file without studying. The more obvious dangers were not too great either: a busy police force would not stop to ask if any of

their fingerprint men had actually developed that smudge; and as for hypoquizzing showing Nikolsky really was the murderer, well, then the print would be assumed that of a passerby who had found the body without reporting it.

So now Sam Hall had killed a Security officer—grabbed him by the neck and smashed his skull with a weighted club. Thornberg felt a lot better.

New York Security shot a request to Central Records for any new material on the Brady case. An automaton received it, compared the codes, and saw that fresh information had been added. The message flashed back, together with the dossier on Sam Hall and two others—for the reconstruction could not be absolutely accurate.

The other two men were safe enough, as it turned out. Both had alibis. The squad that stormed into the Triton Hotel and demanded Sam Hall were met with blank stares. No such person was registered. No one of that description was known here. A thorough quizzing corroborated this. So—Sam Hall had managed to fake an address. He could have done that easily enough by punching the buttons on the hotel register when no one was looking. Sam Hall could be anywhere!

Andy Nikolsky, having been hypoed and found harmless, was released. The fine for possessing sub-

versive literature would put him in debt for the next few years, he had no influential friends to get it suspended, but he'd stay out of trouble if he watched his step. Security sent out an alarm for Sam Hall.

Thornberg derived a sardonic amusement from watching the progress of the hunt as it came to Matilda. No one with that ID card had bought tickets on any public transportation. That proved nothing. Of the hundreds who vanished every year, some at least must have been murdered for their ID cards, the bodies disposed of. Matilda was set to give the alarm when the ID of a disappeared person showed up somewhere. Thornberg faked a few such reports, just to give the police something to do.

He slept more poorly each night, and his work suffered. Once he met Martha Obrenowicz on the street—passed hastily by without greeting her—and couldn't sleep at all, even with maximum permissible drugging.

The new ID system was completed. Machines sent notices to every citizen, with orders to have their numbers tattooed on the right shoulder blade within six weeks. As each tattoo center reported that such-and-such a person had had the job done, Matilda's robots changed the record appropriately. Sam Hall, AX-428-399-075, did not report for his tattoo. Thornberg chuckled at the AX symbol.

Then the telecasts flashed a story that made the nation sit up and listen.

Bandits had held up the First National Bank in Americatown, Idaho—formerly Moscow—making off with a good five million dollars in assorted bills. From their discipline and equipment it was assumed that they were rebel agents, possibly landing in a spaceship from their unknown interplanetary base, and that the raid was intended to help finance their nefarious activities. Security was co-operating with the armed forces to track down the evildoers, and arrests were expected hourly, et cetera, et cetera, et cetera.

Thornberg went to Matilda for a complete account. It had been a bold job. The robbers had apparently worn plastic face-masks, and light body armor under ordinary clothes. In the scuffle of the getaway, one man's mask had slipped aside—only for a moment, but a clerk who happened to see it had, with the aid of hypnosis, given a fairly good description. A brown-haired, heavy-set fellow, Roman nose, thin lips, toothbrush mustache.

Thornberg hesitated. A joke was a joke; and helping poor Nikolsky was, perhaps, morally defensible, but aiding and abetting a felony which was, in all likelihood, an act of treason—

He grinned at himself, without much humor. Swiftly he changed the record. The crook had been of medium height, dark, scar-faced, broken-nosed—He sat for a while wondering how sane he was. How sane anybody was.

Security Central asked for the complete file on the holdup, with any correlations the machine could make. It was sent to them. The description given could have been that of many men, but the scanners eliminated all but one possibility. *Sam Hall*.

The hounds bayed forth again. That night Thornberg slept well.

Dear Dad,

Sorry I haven't written before, but we've been kept pretty busy here. As you know, I've been with a patrol in Gorbuvashar for the past several weeks—desolate country, like all this blasted planet. Sometimes I wonder if I'll ever see the sun again. And lakes and forests and—who wrote that line about the green hills of Earth? We can't get much to read out here, and sometimes my mind feels rusty. Not that I'm complaining, of course. This is a necessary job, and somebody has to do it.

We'd hardly gotten back from the patrol when we were called out on special duty, bundled into rockets and tossed halfway around the planet through the worst galaxy I've ever seen, even on Venus. If I hadn't been an officer and therefore presumably a gentleman, I'd have upchucked. A lot of the boys did, and we were a pretty sorry crew when we landed. But we had to go into action right away. There was a strike in the thorium mines and the local men couldn't break it. We had to use guns before we could bring them to reason. Dad, I felt sorry for the poor devils, I don't mind admitting it. Rocks and hammers and sluice hoses against machine guns! And conditions in the mines are pretty rugged. They DELETED BY CENSOR someone has to do that job too, and if no one will volunteer for any kind of pay they have to assign civilian-service men arbitrarily. It's for the state.

Otherwise nothing new. Life is pretty monotonous. Don't believe the adventure stories—adventure is weeks of boredom punctuated by moments of being scared gutless. Sorry to be so brief, but I want to get

this on the outbound rocket. Won't be another for a couple of months. Everything well, really. I hope the same for you and live for the day we'll meet again. Thanks a million for the cookies—you know you can't afford to pay the freight, you old spendthrift! Martha baked them, didn't she? I recognized the Obrenowicz touch. Say hello to her and Jim for me. And most of all, my kindest thoughts go to you.

As ever,
Jack

The telecasts carried "Wanted" messages for Sam Hall. No photographs of him were available, but an artist could draw an accurate likeness from Matilda's precise description, and his truculent face began to adorn public places. Not long thereafter, the Security offices in Denver were blown up by a grenade tossed from a speeding car which vanished into traffic. A witness said he had glimpsed the thrower, and the fragmentary picture given under hypnosis was not unlike Sam Hall's. Thornberg doctored the record a bit to make it still more similar. The tampering was risky, of course; if Security ever got suspicious, they could easily check back with their witnesses. But it was not too big a chance to take, for a scientifically quizzed man told everything germane to the subject which his memory, conscious, subconscious, and cellular, held. There was never any reason to repeat such an interrogation.

Thornberg often tried to analyze his own motives. Plainly enough, he disliked the government. He must

have contained that hate all his life, carefully suppressed from awareness, and only recently had it been forced into his conscious mind; not even his subconscious could have formulated it earlier, or he would have been caught by the loyalty probes. The hate derived from a lifetime of doubts (Had there been any real reason to fight Brazil, other than to obtain those bases and mining concessions? Had the Chinese attack perhaps been provoked—or even faked, for their government had denied it?) and the million petty frustrations of the garrison state. Still—the strength of it! The violence!

By creating Sam Hall, he had struck back, but it was an ineffectual blow, a timid gesture. Most likely, his basic motive was simply to find a half-way safe release; in Sam Hall, he lived vicariously all the things that the beast within him wanted to do. Several times he had intended to discontinue his sabotage, but it was like a drug: Sam Hall was becoming necessary to his own stability.

The thought was alarming. He ought to see a psychiatrist—but no, the doctor would be bound to report his tale, he would go to camp and Jack, if not exactly ruined, would be under a cloud for the rest of his life. Thornberg had no desire to go to camp, anyway. His own existence had compensations—interesting work, a few good friends, art and music and literature, decent wine, sunsets and

mountains, memories. He had started this game on impulse, but now it was too late to stop it.

For Sam Hall had been promoted to Public Enemy Number One.

Winter came, and the slopes of the Rockies under which Matilda lay were white beneath a cold greenish sky. Air traffic around the nearby town was lost in that hugeness, brief hurtling meteors against infinity; ground traffic could not be seen at all from the Records entrance. Thornberg took the special tubeway to work every morning, but he often walked the five miles back, and his Sundays were usually spent in long hikes over the slippery trails. That was a foolish thing to do alone in winter, but he felt reckless.

He was working in his office shortly before Christmas when the intercom said: "Major Sorensen to see you, sir. From Investigation."

Thornberg felt his stomach tie itself into a cold knot. "All right," he answered in a voice whose levelness surprised him. "Cancel any other appointments." Security Investigation took priority over everything.

Sorensen walked in with a hard, military clack of boots. He was a big blond man, heavy-shouldered, his face expressionless and his eyes as pale and cold and remote as the winter sky. The black uniform fitted him like another skin, the lightning badge of his service glittered against it like

a frosty star. He stood stiffly before the desk, and Thornberg rose to give him an awkward salute.

"Please sit down, Major Sorensen. What can I do for you?"

"Thanks." The cop's voice was crisp and harsh. He lowered his bulk into a chair and drilled Thornberg with his eyes. "I've come about the Sam Hall case."

"Oh—the rebel?" Thornberg's skin prickled. It was all he could do to meet those eyes.

"How do you know he's a rebel?" asked Sorensen. "It's never been proved officially."

"Why . . . I assumed . . . that bank raid . . . and then the posters say he's believed to be in the underground—"

Sorensen inclined his cropped head ever so slightly. When he spoke again, it was in a relaxed tone, almost casual: "Tell me, Major Thornberg, have you followed the Hall dossier in detail?"

Thornberg hesitated. He wasn't supposed to do so unless ordered; he only kept the machine running. A memory came back to him, something he had read once: "When suspected of a major sin, admit the minor ones frankly. It disarms suspicion." Something like that.

"As a matter of fact, I have," he said. "I know it's against regs, but I was interested and . . . well, I couldn't see any harm in it. I've not discussed it with anyone, of course."

"No matter." Sorensen waved a

muscular hand. "If you hadn't done so, I'd have ordered you to. I want your opinion on this."

"Why . . . I'm not a detective—"

"You know more about Records, though, than anyone else. I'll be frank with you—under the rose, naturally." Sorensen seemed almost friendly now. *Was it a trick to put his prey off guard?* "You see, there are some puzzling features about this case."

Thornberg kept silent. He wondered if Sorensen could hear the thudding of his heart.

"Sam Hall is a shadow," said the cop. "The most careful checkups eliminate any chance of his being identical with anyone else of that name. In fact, we've learned that the name occurs in a violent old drinking song—is it coincidence, or did the song suggest crime to Sam Hall, or did he by some incredible process get that alias into his record instead of his real name? Whatever the answer there, we know that he's ostensibly without military training, yet he's pulled off some beautiful pieces of precision attack. His IQ is only 110, but he evades all our traps. He has no politics, yet he turns on Security without warning. We have not been able to find one person who remembers him, not one, and believe me, we have been thorough. Oh, there are a few subconscious memories which might be of him, but probably aren't—and so aggressive a personality should be remembered consciously. No under-

ground or foreign agent we've caught had any knowledge of him, which defies probability. The whole business seems impossible."

Thornberg licked his lips. Sorensen, the hunter of men, must know he was frightened; but would he assume it to be the normal nervousness of a man in the presence of a Security officer?

Sorensen's face broke in a hard smile. "As Sherlock Holmes once remarked," he said, "when you have eliminated every other hypothesis, then the one which remains, however improbable, must be the right one."

Despite himself, Thornberg was jolted. Sorensen hadn't struck him as a reader.

"Well," he asked slowly, "what is your remaining hypothesis?"

The other man watched him for a long time, it seemed forever, before replying: "The underground is more powerful and widespread than people realize. They've had some seventy years to prepare, and there are many good brains in their ranks. They carry on scientific research of their own. It's top secret, but we know they have perfected a type of weapon we cannot duplicate yet. It seems to be a hand gun throwing bolts of energy—a blaster, you might call it—of immense power. Sooner or later, they're going to wage open war against the government.

"Now, could they have done something comparable in psychology?"

Could they have found a way to erase or cover up, selectively, memories, even on the cellular level? Could they know how to fool a personality tester, how to disguise the mind itself? If so, there may be any number of Sam Halls in our very midst, undetectable until the moment comes for them to strike."

Thornberg felt almost boneless. He couldn't help gasping his relief, and hoped Sorensen would take it for a sign of alarm.

"The possibility is frightening, isn't it?" The blond man laughed harshly. "You can imagine what is being felt in high official circles. We've put all the psychological researchers we could get to work on the problem—bah! Fools! They go by the book, they're afraid to be original even when the state tells them to.

"It may just be a wild fancy, of course. I hope it is. But we have to *know*. That's why I approached you personally, instead of sending the usual requisition. I want you to make a search of the records—everything pertaining to the subject, every man, every discovery, every hypothesis. You have a broad technical background and, from your psychorecord, an unusual amount of creative imagination. I want you to do what you can to correlate all your data. Co-opt anybody you need. Submit to my office a report on the possibility—or should I say probability—of this notion and, if there is any likelihood

of its being true, sketch out a research program which will enable us to duplicate the results and counteract them."

Thornberg fumbled for words. "I'll try," he said lamely. "I'll do my best."

"Good. It's for the state."

Sorensen had finished his official business, but he didn't go at once. "Rebel propaganda is subtle stuff," he said quietly, after a pause. "It's dangerous because it uses our own slogans, with a twisted meaning. Liberty, equality, justice, peace. Too many people can't appreciate that times have changed, and the meanings of words have necessarily changed with them."

"I suppose not," said Thornberg. He added the lie: "I never thought much about it."

"You should," said Sorensen. "Study your history. When we lost World War III, we had to militarize to win World War IV, and after that, for our own safety, we had to mount guard on the whole human race. The people demanded it at the time."

The people, thought Thornberg, never appreciated freedom till they'd lost it. They were always willing to sell their birthright. Or was it merely that, being untrained in thinking, they couldn't see through demagoguery, couldn't visualize the ultimate consequences of their wishes? He was vaguely shocked at the thought; wasn't he able to control his own mind any longer?

"The rebels," said Sorensen, "claim

that conditions have changed, that militarization is no longer necessary—if it ever was—and that America would be safe enough in a union of free countries. It's devilishly clever propaganda, Major Thornberg. Watch out for it."

He got up and took his leave. Thornberg sat for a long time staring at the door. Sorensen's last words were—odd, to say the least. Was it a hint—or was it bait in a trap?

The next day Matilda received a news item whose details were carefully censored for the public channels. A rebel force had landed in the stockade of Camp Jackson, in Utah, gunned down the guards, and taken away the prisoners. The camp doctor had been spared, and related that the leader of the raid, a stocky man in a mask, had ironically said to him: "Tell your friends I'll call again. My name is Sam Hall."

Space Guard ship blown up on Mesa Verde Field. On a fragment of metal someone has scrawled: "Compliments of Sam Hall."

Army quartermaster depot robbed of a million dollars. Bandit chief says, before disappearing, that he is Sam Hall.

Squad of Security police, raiding a suspected underground hideout in New Pittsburgh, cut down by machine gun fire. Voice over hidden loud-speaker cries: "My name is Sam Hall!"

Dr. Matthew Thomson, chemist in Seattle, suspected of underground connections, is gone when his home is raided. Note left on desk says: "Off to visit Sam Hall. Back for liberation. M. T."

Defense plant producing important robomb parts blown up near Miami by pony atomic bomb, after being warned over the phone that the bomb has been planted and they have half an hour to get their workers out. The caller, masked, styles himself Sam Hall.

Army laboratory in Houston given similar warning by Sam Hall. A fake, but a day's valuable work is lost in the alarm and the search.

Scribbled on walls from New York to San Diego, from Duluth to El Paso, Sam Hall, Sam Hall, Sam Hall.

Obviously, thought Thornberg, the underground had seized on the invisible and invincible man of legend and turned him to their own purposes. Reports of him poured in from all over the country, hundreds every day—Sam Hall seen here, Sam Hall seen there. Ninety-nine per cent could be dismissed as hoaxes, hallucinations, mistakes; it was another national craze, fruit of a jittery time, like the sixteenth- and seventeenth-century witch hunts or the twentieth-century flying saucers. But Security and civilian police had to check on each one.

Thornberg planted a number of them himself.



Mostly, though, he was busy with his assignment. He could understand what it meant to the government. Life in the garrison state was inevitably founded on fear and mistrust, every man's eye on his neighbor; but at least psychotyping and hypnoquizzing had given a degree of surety. Now, with that staff knocked out from under them—

His preliminary studies indicated that a discovery such as Sorensen had hypothesized, while not impossible,

was too far beyond the scope of modern science for the rebels to have perfected. Such research carried on nowadays would, from the standpoint of practicality if not of knowledge, be a waste of time and trained men.

He spent a good many sleepless hours, and used up a month's cigarette ration, before he could decide what to do. All right, he'd aided insurrection in a small way, and he shouldn't boggle at the next step. Still—Did he want to?

Jack—the boy had a career lined out for himself. He loved the big deeps beyond the sky as he would love a woman. If things changed, what then of Jack's career?

Well, what was it now? Stuck on a dreary planet as guardsman and executioner of homesick starvelings poisoned by radioactivity—never even seeing the sun. Come the day, Jack could surely wangle a berth on a real spacer; they'd need bold men to explore beyond Saturn. Jack was too honest to make a good rebel, but Thornberg felt that after the initial shock he would welcome a new government.

But treason! Oaths!

When in the course of human events—

It was a small thing which decided Thornberg. He passed a shop downtown and noticed a group of the Youth Guard smashing in its windows and spattering yellow paint over the goods. Once he had taken his path, a curious serenity possessed him. He stole a vial of prussic acid from a chemist friend and carried it in his pocket; and as for Jack, the boy would have to take his chances too.

The work was demanding and dangerous. He had to alter recorded facts which were available elsewhere, in books and journals and the minds of men. Nothing could be done with basic theory, of course, but quantitative results could be juggled a little so that the overall picture was subtly askew. He would co-opt carefully

chosen experts, men whose psychotypes indicated they would take the easy course of relying on Matilda instead of checking the original sources. And the correlation and integration of innumerable data, the empirical equations and extrapolations thereof, they could be tampered with.

He turned his regular job over to Rodney and devoted himself entirely to the new one. He grew thin and testy; when Sorensen called up trying to hurry him, he snapped back: "Do you want speed or quality?" and wasn't too surprised at himself afterward. He got little sleep, but his mind seemed unnaturally clear.

Winter faded into spring while Thornberg and his experts labored and while the nation shook, psychically and physically, with the growing violence of Sam Hall. The report Thornberg submitted in May was so voluminous and detailed that he didn't think the government researchers would bother referring to any other source. Its conclusion: Yes, given a brilliant man applying Belloni matrices to cybernetic formulas and using some unknown kind of colloidal probe, a psychological masking technique was plausible.

The government yanked every man it could find into research. Thornberg knew it was only a matter of time before they realized they had been had. How much time, he couldn't say. But when they were sure—

"Now up the rope! I go, up I go."

Now up the rope I go, up I go.

And the devils down below,

They say: 'Sam, we told you so.'

They say: 'Sam, we told you so,'

Damn their hide."

REBELS ATTACK SPACESHIPS LAND UNDER COVER OF RAINSTORM, SEIZE POINTS NEAR N. DETROIT FLAME WEAPONS USED AGAINST ARMY BY REBELS

"The infamous legions of the traitors have taken key points throughout the nation, but already our gallant forces have hurled them back. They have come out in early summer like toadstools, and will wither as fast—WHEEEEEEE-OOOOOO!" Silence.

"All citizens are directed to keep calm, remain loyal to their country and stay at their usual tasks until otherwise ordered. Civilians will report to their local defense commanders. All military reservists will report immediately for active duty."

"Hello, Hawaii! Are you there? Come in, Hawaii! Calling Hawaii!"

"CQ, Mars GHQ calling . . . *bzzz*, *wheeee* . . . seized Syrtis Major Colony and . . . *whoooo* . . . help needed—"

The Lunar rocket bases are assaulted and carried. The commander blows them up rather than surrender. A pinpoint flash on the Moon's face, a new crater, what will they name it?

"So they've got Seattle, have they? Send a robomb flight. Blow the place

off the map. This is war!"

". . . In New York. Secretly drilled rebels emerged from the notorious Crater district and stormed—"

". . . Assassins were shot down. The new President has already been sworn in and—"

BRITAIN, CANADA, AUSTRALIA REFUSE ASSISTANCE TO GOV'T

". . . No, sir. The bombs reached Seattle all right. But they were all stopped before they hit—some kind of energy gun."

"COMECO to all Army commanders in Florida and Georgia: Enemy action has made Florida and the keys temporarily untenable. Army units will withdraw as follows—"

"Today a rebel force engaging an Army convoy in Donner Pass was annihilated by a well-placed tactical atomic bomb. Though our own men suffered losses on this account—"

"COMWECO to all Army commanders in California: The mutiny of units stationed near San Francisco poses a grave problem—"

SP RAID REBEL HIDEOUT, BAG FIVE OFFICERS

"All right, so the enemy is about to capture Boston. We *can't* issue weapons to the citizens. They might turn them on us!"

SPACE GUARD UNITS EXPECTED FROM VENUS

Jack, Jack, Jack!

It was strange, living in the midst

of a war. Thornberg had never thought it would be like this. Drawn faces, furtive eyes, utter confusion in the telecast news and the irregularly arriving papers, blackouts, civil-defense drills, shortages, occasional panic when a rebel jet whistled overhead—but nothing else. No gunfire, no bombs, no battles at all except the unreal ones you heard about. The only casualty lists here were due to Security—people kept disappearing, and nobody spoke about them.

But then, why should the enemy bother with this unimportant mountain town? The Army of Liberation, as it styled itself, was grabbing key points of industry, transportation, communication; was fighting military units, sabotaging buildings and machines, assassinating important men in the government. By its very purpose, it couldn't wage total war, couldn't annihilate the folk it wanted to free. Rumor had it that the defenders were not so finicky.

Most citizens were passive. They always are. It is doubtful if more than one fourth of the population was ever near a combat during the Third American Revolution. City dwellers might see fire in the sky, hear the whistle and crash of artillery, scramble out of the way of soldiers and armored vehicles, cower in shelters when the rockets thundered overhead—but the battle was fought outside town. If it came to street fighting, the rebels wouldn't push in; they

would either withdraw and wait, or they would rely on agents inside the city. Then one might hear the crack of rifles and grenades, rattle of machine guns, sharp discharge of energy beams, and see corpses in the street. But it ended with a return of official military government or with the rebels marching in and setting up their own provisional councils. (They were rarely greeted with cheers and flowers. Nobody knew how the war would end. But there were words whispered to them, and they usually got good service.) As nearly as possible, the average American continued his average life.

Thornberg went on in his own ways. Matilda, as the information center, was working at full blast. If the rebels ever learned where she was—

Or did they know?

He could not spare much time for his private sabotage, but he planned it carefully and made every second tell when he was alone in the control booth. Sam Hall reports, of course—Sam Hall here, Sam Hall there, pulling off this or that incredible stunt. But what did one man, even a superman, count for in these gigantic days? Something else was needed.

Radio and newspapers announced jubilantly that Venus had finally been contacted. The Moon and Mars had fallen, there was only silence from the Jovian satellites, but everything seemed in order on Venus, a few feeble uprisings had been quickly smashed. The powerful Guard units

there would be on their way to Earth at once. Troop transports had to orbit most of the way, so it would take a good six weeks before they could arrive, but when they did they would be a powerful reinforcement.

"Looks like you might see your boy soon, chief," said Rodney.

"Yes," said Thornberg. "I might."

"Tough fighting." Rodney shook his head. "I'd sure hate to be in it."

If Jack is killed by a rebel gun, when I have aided the rebels' cause—

Sam Hall, reflected Thornberg, had lived a hard life, all violence and enmity and suspicion. Even his wife hadn't trusted him.

*" . . . And my Nellie dressed in blue
Says: 'Your trifling days are
through.*

*Now I know that you'll be true,
Damn your hide.' "*

Poor Sam Hall. It was no wonder he had killed a man.

Suspicion!

Thornberg stood for a taut moment while an eerie tingle went through him. The police state was founded on suspicion. Nobody could trust anyone else. And with the new fear of psycho-masking, and research on that project suspended during the crisis—

*Steady, boy, steady. Can't rush into
this. Have to plan it out very carefully.*

Thornberg punched for the dossiers of key men in the administration, in the military, in Security. He did it in the presence of two assistants, for he

thought that his own frequent sessions alone in the control booth were beginning to look funny.

"This is top secret," he warned them, pleased with his own cool manner. He was becoming a regular Machiavelli. "You'll be skinned alive if you mention it to anyone."

Rodney gave him a shrewd glance. "So they're not even sure of their own top men now, are they?" he murmured.

"I've been told to make some checks," snapped Thornberg. "That's all you need to know."

He studied the files for many hours before coming to a decision. Secret observations were, of course, made of everyone from time to time. A cross-check with Matilda showed that the cop who had filed the last report on Lindahl had been killed the next day in a spontaneous and abortive uprising. The report was innocuous: Lindahl had stayed at home, studying some papers; he had been alone in the house except for a bodyguard who had been in another room and not seen him. And Lindahl was Undersecretary of Defense.

Thornberg changed the record. A masked man—stocky, black-haired—had come in and talked for three hours with Lindahl. They had spoken low, so that the cop's ears, outside the window, couldn't catch what was said. The visitor had gone away then, and Lindahl had retired. The cop went back in great excitement and

made out his report and gave it to the signalman, who had sent it on to Matilda.

Tough on the signalman, thought Thornberg. They'll want to know why he didn't tell this to his chief in New Washington, if the observer was killed before doing so. He'll deny every such report, and they'll hypnoquiz him—but they don't trust that method any more!

His sympathy didn't last long. What counted was having the war over before Jack got here. He re-filed the altered spool and did a little back-tracking, shifting the last report of Sam Hall from Salt Lake City to Philadelphia. Make it more plausible. Then, as opportunity permitted, he did some work on other men's records.

He had to wait two haggard days before the next requisition came from Security for a fresh cross-check on Sam Hall. The scanners swept in an intricate pattern, a cog turned over, a tube glowed. Circuits were activated elsewhere, the spool LINDAHL was unrolled before the microprinter inside the machine. Cross-references to that spool ramified in all directions. Thornberg sent the preliminary report back with a query: This matter looked interesting, did they want more information?

They did!

Next day the telecast announced a drastic shakeup in the Department of Defense. Lindahl was not heard from again.

And I, thought Thornberg grimly, have grabbed a very large tiger by the tail. Now they'll have to check everybody—and I'm one man, trying to keep ahead of the whole Security Police!

Lindahl is a traitor. How did his chief ever let him get on the board? Secretary Hoheimer was pretty good friends with Lindahl, too. Get Records to cross-check Hoheimer.

What's this? Hoheimer himself! Five years ago, yes, but even so—the records show that he lived in an apartment unit where Sam Hall was janitor! Grab Hoheimer! Who'll take his place? General Halliburton? That stupid old fool? Well, at least his dossier is clean. Can't trust those slick characters.

Hoheimer has a brother in Security, general's rank, good detection record. A blind? Who knows? Slap the brother in jail, at least, for the duration. Better check his staff—Central Records shows that his chief field agent, Jones, has five days unaccounted for a year ago; he claimed Security secrecy at the time, but a double cross-check shows it wasn't so. Shoot Jones! He has a nephew in the Army, a captain. Pull that unit out of the firing line till we can study it man by man! We've had too many mutinies already.

Lindahl was also a close friend of Benson, in charge of the Tennessee Atomic Ordnance Works. Haul Benson in! Check every man connected

with him! No trusting those scientists, they're always blabbing secrets.

The first Hoheimer's son is an industrialist, he owns a petroleum-synthesis plant in Texas. Nab him! His wife is a sister of Leslie, head of the War Production Co-ordination Board. Get Leslie, too. Sure, he's doing a good job, but he may be sending information to the enemy. Or he may just be waiting for the signal to sabotage the whole works. We can't trust *anybody*, I tell you!

What's this? Records relays an Intelligence report that the mayor of Tampa was in cahoots with the rebels. It's marked "Unreliable, Rumor"—but Tampa *did* surrender without a fight. The mayor's business partner is Gale, who has a cousin in the Army, commanding a robomb base in New Mexico. Check both the Gales, Records— So the cousin was absent four days without filing his whereabouts, was he? Military privileges or not, arrest him and find out where he was!

Attention, Records, attention, Records, urgent. Brigadier John Harmsworth Gale, et cetera, et cetera, et cetera, refused to divulge information required by Security officers, claiming to have been at his base all the time. Can this be an error on your part?

Records to Security Central, ref: et cetera, et cetera. No possibility of error exists except in information received.

To Records, ref: et cetera, et cetera.

Gale's story corroborated by three of his officers.

Put that whole base under arrest! Re-check those reports! Who sent them in, anyway?

To Records, ref: et cetera, et cetera. On attempt to arrest entire personnel, Robomb Base 37-J fired on Security detachment and repulsed it. At last reports, Gale was calling for rebel forces fifty miles off to assist him. Details will follow for the files as soon as possible.

So Gale was a traitor! Or was he driven to it by fear? Have Records find out who filed that information about him in the first place. *We can't trust anybody!*

Thornberg was not much surprised when his door was kicked open and the Security squad entered. He had been expecting it for days now. One man can't keep ahead of the game forever. No doubt the accumulated inconsistencies had finally drawn suspicion his way; or perhaps, ironically, the chains of accusation he had forged had by chance led to him; or perhaps Rodney or another person here had decided something was amiss with the chief and lodged a tip.

He felt no blame for whoever it was if that had been the case. The tragedy of civil war was that it turned brother against brother; millions of good and decent men were with the government because they had pledged themselves to be. Mostly, he felt tired.

He looked down the barrel of the gun and then raised weary eyes to the hard face behind it. "I take it I'm under arrest?" he asked tonelessly.

"Get up!" The face was flat and brutal, there was sadism in the heavy mouth. A typical blackcoat.

June whimpered. The man who held her was twisting her arm behind her back. "Don't do that," said Thornberg. "She's innocent."

"Get up, I said!" The gun thrust closer.

"Don't come near me, either." Thornberg lifted his right hand. It was clenched around a little ball. "See this? It's a gimmick I made. No, not a bomb, just a small radio control. If my hand relaxes, the rubber will expand and pull a switch shut."

The men recoiled a little.

"Let the girl go, I said," repeated Thornberg patiently.

"You surrender first!"

June screamed as the cop twisted harder.

"No," said Thornberg. "This is more important than any one of us. I was prepared, you see. I expect to die. So if I let go of this ball, the radio signal closes a relay and a powerful magnetic field is generated in Matilda—in the records machine. Every record the government has will be wiped clean. I hate to think what your fellows will do to you if you let that happen."

Slowly, the cop released June. She

slumped to the floor, crying.

"It's a bluff!" said the man with the gun. There was sweat on his face.

"Try it and find out." Thornberg forced a smile. "I don't care."

"You traitor!"

"And a very effective one, wasn't I? I've got the government turned end for end and upside down. The Army's in an uproar, officers deserting right and left for fear they'll be arrested next. Administration is hog-tied and trembling. Security is chasing its own tail around half a continent. Assassination and betrayal are daily occurrences. Men go over to the rebels in droves. The Army of Liberation is sweeping a demoralized and ineffectual resistance before it everywhere. I predict that New Washington will capitulate within a week."

"And your doing!" Finger tense on the trigger.

"Oh, no. No single man can change history. But I was a rather important factor, yes. Or let's say—Sam Hall was."

"What are you going to do?"

"That depends on you, my friend. If you shoot me, gas me, knock me out, or anything of that sort, my hand will naturally relax. Otherwise, we'll just wait till one side or the other gets tired."

"You're bluffing!" snapped the squad leader.

"You could, of course, have the technicians here check Matilda and see if I'm telling the truth," said

Thornberg. "And if I am, you could have them disconnect my electromagnet. Only I warn you, at the first sign of any such operation on your part, I'll let go of this ball. Look in my mouth." He opened it. "A glass vial, full of poison. After I let the ball go, I'll close my teeth together hard. So you see, I have nothing to fear from you."

Bafflement and rage flitted over the faces that watched him. They weren't used to thinking, those men.

"Of course," said Thornberg, "there is one other possibility for you. At last reports, a rebel jet squadron was based not a hundred miles from here. We could call it and have them come and take this place over. That might be to your own advantage, too. There is going to be a day of reckoning with you blackcoats, and my influence could shield you however little you deserve it."

They stared at each other. After a very long while, the squad leader shook his head. "No!"

The man behind him pulled out a gun and shot him in the back.

Thornberg smiled.

"As a matter of fact," he told Sorensen, "I was bluffing. All I had was a tennis ball with a few small electrical parts glued on it. Not that it made much difference at that stage, except to me."

"Matilda will be handy for us in mopping up," said Sorensen. "Want

to stay on?"

"Sure, at least till my son arrives. That'll be next week."

"You'll be glad to hear we've finally contacted the Guard in space: just a short radio message, but the commander has agreed to obey whatever government is in power when he arrives. That'll be us, so your boy won't have to do any fighting."

There were no words for that. Instead Thornberg said, with a hard-held casualness, "You know, I'm surprised that *you* should have been an undergrounder."

"There were a few of us even in Security," said Sorensen. "We were organized in small cells, spotted throughout the nation, and wangled things so we could hypnoquiz each other." He grimaced. "It wasn't a pleasant job, though. Some of the things I had to do— Well, that's over with now."

He leaned back in his chair, putting his booted feet on the desk. A Liberation uniform was usually pretty sloppy, they didn't worry about spit-and-polish, but he had managed to be immaculate. "There was a certain amount of suspicion about Sam Hall at first," he said. "The song, you know, and other items. My bosses weren't stupid. I got myself detailed to investigate you; a close check-up gave me grounds to suspect you of revolutionary thoughts, so naturally I gave you a clean bill of health. Later on I cooked up this fantasy of the

psychological mask and got several high-ranking men worried about it. When you followed my lead on that, I was sure you were on our side." He grinned. "So naturally our army never attacked Matilda!"

"You must have joined your forces quite recently."

"Yeah, I had to scram out of Security during the uproar and witch hunt you started. You almost cost me my life, Thorny, know that? Well worth it, though, just to see those cockroaches busily stepping on each other."

Thornberg leaned gravely over his desk. "I always had to assume you rebels were sincere," he said. "I've never been sure. But now I can check up. Do you intend to destroy Matilda?"

Sorensen nodded. "After we've used her to help us find some people we want rather badly, and to get re-organized—of course. She's too powerful an instrument. It's time to loosen the strings of government."

"Thank you," said Thornberg.

He chuckled after a moment. "And that will be the end of Sam Hall," he said. "He'll go to whatever Valhalla is reserved for the great characters of fiction. I can see him squabbling with Sherlock Holmes and shocking King Arthur and striking up a beautiful friendship with Long John Silver. You know how the ballad ends?" He sang softly: "*Now up in heaven I dwell, in heaven I dwell—*"

Unfortunately, the conclusion is pretty rugged. Sam Hall never was satisfied.

THE END

IN FURTHER EXPLANATION . . .

Dear Mr. Campbell:

After publication of my article, "Five Billion Dollar Magpie," in the March, 1953, issue of *Astounding Science-Fiction* I received a number of very interesting letters from chemists and others asking for additional details regarding the handling of various scrap materials. In all cases I referred them again to that excellent book by Charles H. Lipsett, "Industrial Wastes, Their Conservation and Utilization," published in 1951 by the Atlas Publishing Co., Inc., 425 West 25th Street, New York. Since it is the only authentic published source of information on this complex subject, I quoted very extensively from "Industrial Wastes" in the second half of my article.

I also have had three queries about the argon cutting torch I mentioned on page 84. Further checking indicates that, while there are welding torches that use a sheath of inert gas around the flame to avoid oxidation of the hot metal near the weld, it is doubtful that these have much use in the scrap industry yet except, perhaps, in the cutting of such touchy metals as magnesium and titanium. If you run across further information regarding such torches, please pass it along.

Wallace West

PIONEER

BY LEE CORREY

The first man to take that first tricky, uncertain, rickety contraption, Rocketship #1, outside Earth's atmosphere will, of course, be a Hero, doing the dangerous job because of high dedication to the purpose . . .

"Has anybody taken it yet?"

"What do you think?"

"Good. I'll take the job."

Donald L. Karlter of the Aircraft and Rocket Division, Karlter Ship & Drydock Company, sat up quickly and grinned at the stocky little test pilot standing before the desk. "Fine! I knew you'd change your mind, Dick." He got up, pocketing his cigarettes and lighter. "Let's get out to the field. We've only got seven hours."

Dick Crowell sat down on the edge of the desk instead. "Let's talk money first."

Illustrated by van Dongen



"We already have," Don said as he froze in the act of picking up his battered hat.

"That was before the gyros burned out in the *Nomad*."

"So what? The ship will still perform."

"Not safely," Dick reminded him.

Don sighed with exasperation. "Look, I've told you the boys at Point Mugu say the *Nomad* will get into circular orbit O.K. Those twin gyro units were only precautionary."

"Only precautionary, huh? Are the Point Mugu boys going to ride the ship?"

"Want to see their report?"

"No. Just ask the boys at White Sands about the single gyros on the V-2 back in the Forties," the pilot countered. "I know better than to trust a single gyro-stabilizing unit. Gyros have a nasty habit of tumbling. I've seen them."

Double gyro systems were standard equipment on the Navy's KX-238 Karlter transocean rockets, providing a stand-by unit in case one system failed. Then, the stand-bys took over, keeping the rocket under control. Sometimes the stand-bys tumbled too, but rocket pilots didn't live to talk about that.

Taking up a rocket with a single set of gyros was sheer, calculated suicide.

Project *Nomad*, Karlter's naval round-the-world rocket, had been designed with twin gyro units, but four days ago in the mock firing, one set

had burned out. The next day, they learned that Zeiss-Jena could not deliver another set for six weeks.

And Dick Crowell, who had been with the project since its inception and the only man who knew enough about the *Nomad* to fly her, had refused to take it up with one gyro system. That was Friday; today was Monday, scheduled shoot-day.

"That ship is *not* safe," Dick said emphatically, "but I'm willing to take the chance on one gyro system — for a price."

Karlter sat back down and put his cigarettes on the desk again. "Friday you said you wouldn't fly the *Nomad* for a million bucks," he observed. "What's your price today?"

"Fifty grand."

"What?"

"Take it or leave it."

"Dick, I can't pay you that much! How about twenty-five?"

"I said fifty — just another entry in your cost-plus contract."

Dick looked pained, then glanced at the wall clock. "Dick, we can't afford to stand here and haggle. That ship is scheduled to go in seven hours. Take it up, and we'll talk money when you get down."

"I may not get down. We'll talk now."

Don fidgeted nervously. "I can't pay that price."

"O.K., wait six weeks," Dick said, "and put the other gyro in. Then I'll fly her for the original price."

Karlter knew that was too long. The Navy wanted that orbital spaceship *now*. It would be the first to circle the world like a small moon. But the Air Force wanted the orbital rocket for its own also, and it was a race against time for jurisdiction. The Navy claimed that an orbital rocket could be landed only on the ocean, while the fliers contended that the practical design was one that could easily land on level ground by means of large series parachutes. Neither method had been tried with a manned orbital rocket. If the Navy could prove that ocean landing worked, theirs would be the jurisdiction over orbital rockets, and the space stations and interplanetary travel that would follow. But they had to get the *Nomad* up there first.

Great Western Aircraft was within a week of attempting to put a ship into orbit for the Air Force, and the Navy could not afford to bet failure for the Air Force project.

Project *Nomad* had to go up on schedule — even if it carried only one set of gyros.

"O.K., O.K., you get your way," Don sighed, reaching for a slip of paper. "Fifty it is. The Old Man will scream, but I talked him into this in the first place. How do you want it?"

"Certified check. Twenty-five right now, and the balance when I get down — or deposited in the account of my son if something happens."

"Easy, lad, you'll get down O.K.

I know you've got troubles, but let's concentrate on this job." He was glad to have Dick back, in spite of the cost. It meant the *Nomad* would go on schedule, and he knew Dick was the man to do the job. Project *Nomad* demanded a man with Dick's experience as naval flier, submariner, and rocket pilot, as well as his background at Muroc, the Sands, and Mugu. He scribbled the memo and slipped it in the pneumatic tube. "O.K., that's settled. Accounting will have your check in an hour. Now let's get out to the field!"

"At my mark, the time will be minus-forty minutes. Minus-forty minutes . . . *Mark!*" the blockhouse bull horn boomed through the evening air.

"About time for you to get aboard," Chuck Streiker, the project engineer, prompted.

Dick nodded silently as two Navy flight surgeons checked his gear with him.

Don Karlter materialized out of the gloom carrying a clipboard filled with a wrinkled sheaf of paper. "Everything O.K. here?" he asked nervously.

"She'll fly," Streiker assured him, pushing back his protective "hard-hat" and mopping his brow.

"How about Dick?" Karlter asked.

"I'm O.K.," Dick said as he checked the fit of some body telemetry gear on his leg. "I'd give my left arm for a cigarette now."

"Not here," the project engineer

warned. They were standing less than two hundred feet from the base of the huge ship. The fueling had just been completed, and the two oxygen boil-off valves high on the ship gave the colossal bulk two white plumes of oxygen vapor in the glare of the floodlights. The ground crews were treating her with great respect now, for she was loaded with tons of high-explosive fuel which made her a giant bomb. No one smoked around her. The very mood of the place was one of high tension, with everyone keyed-up, nervous, and short-tempered with the anxiety that always precedes a shoot.

"Have you checked the release on the ground-power plug?" Dick asked as one of the doctors checked the fit of the crash helmet.

"I fixed it personally. You'll find the gyros already running," Streiker pointed out. "We've been checking them for the last four hours."

"That still doesn't mean they won't tumble," Dick pointed out.

Streiker said yes, but it was a chance they had to take.

The bull horn bellowed, "Project engineer, report to control!"

"I've got to get this show on the road. Good luck, Dick; take good care of the *Nomad*." He pumped the pilot's hand earnestly, then disappeared into the dusk toward the blockhouse.

The Navy doctors were satisfied with Crowell's rig; they followed Streiker out of the floodlit area. Don Karlter turned to the pilot. "I'll walk

over to the ship with you."

"Thanks. I'm glad someone realizes I'm here. Everybody seems wrapped up in their gadgets."

The tremendous bulk of the ship was plenty to get wrapped up in, for this was the first manned orbital job. The *Nomad* was an ugly ship; a fat, pyramidal, three-step chemical rocket, she was the best thing engineers working with inadequate fuels could devise. The KX-238 transocean rockets on the other side of the field were beautiful and sleek in comparison with her, but the orbital rocket did not need streamlining. She would literally punch her way through the sea of air to her orbit in the vacuum of space.

Dick looked her over with mixed emotions. She was at the same time an engineering masterpiece and a deadly weapon. If the gyros tracked and the million little items necessary for her successful performance worked right, she would become the first spaceship.

If not, she would kill him, and he knew the chances of that were great. Rocketry, for all its advance, was still ninety per cent good luck. There were too many things to go wrong.

"How do you feel?" Don asked as they stopped by the gantry lift.

"Don, I'm scared."

"You'll be O.K."

"This ship's dangerous. It's a killer; I can feel it."

"Nuts! There isn't anything you can't make fly."

"Not any more. I'm too old; I've used up all my luck," Dick replied, shaking his head. "The rocket planes and transocean jobs, I've always been scared, but this is different."

"Streiker and his boys have lots of faith in the *Nomad*, and they know what they're doing."

"They're not going to ride it —"

Don paused and looked up at the ship, its sides reflecting back the light of the floodlamps. "Dick, I've worked with you and other test pilots for years, and I know you guys turn down a job if it isn't safe as far as you're concerned. You say 'no' and mean it. To you, this ship is dangerous. Why are you doing this?"

"Money."

"Nuts!" Don waved him off. "What's been going on lately between you and your wife? The grapevine says you're on the rocks."

"So maybe it's right for a change."

"Don't tell me that incident in L. A. four months ago —"

"It's not just that. It's lots of things. I just made a bad mistake in the first place, that's all."

"And the fifty grand is the only way out, eh?"

Dick checked his crash helmet. Men were clearing the area, ready to man their stations for take-off. "You might say that. It's the only way I want out."

"Dick, if I were you, I'd take off for South America and not give her one red cent!"

"It's not that simple." He looked up at Don. "If I don't make the grade, will you do something for me?"

Don looked puzzled and nodded.

"I left a letter in your box in the field office. If this deal doesn't pay off for me, open it and do as it says, will you?"

"Sure, but you'll get back O.K. This thing's *got* to be successful, guy. Remember, today the *Nomad*, tomorrow the space station, then the Moon and planets."

Dick managed a smile and shook Don's hand easily. "After this one, I'm just a spectator." He turned quickly and stepped onto the lift.

The *Nomad* had suddenly grown to fantastic size, or so it seemed to Dick as the lift stopped at the hatch over a hundred feet above the tarmac. He wished he hadn't eaten supper; it was lying in his stomach and growling like a discontented animal. He took a quick glance at the field. Lights were winking everywhere, all waiting for this metal monster to throw itself into the evening sky and beyond. Stepping inside, he shut the hatch.

Step Three, the spaceship itself, was nestled inside the fat hull of Step Two, which was in turn surrounded by Step One. Once inside the spaceship, he checked to see that the trim load of 23.8 pounds was strapped in tightly. Its presence, even as dead weight, made certain of the spaceship's balance, its center of gravity.

He merely swallowed hard when he saw the sandbags in the gyro compartment making up the weight of the missing stand-by gyro unit. It reminded him again that he was riding a death ship. "Well, my last ride's going to be a brass-plated doozy," he thought bitterly.

The control room was a cross between those of a plane, a submarine, and a transocean rocket. Stretching out on the adjustable pilot's couch, he turned everything on. The *Nomad's* counterpart of a submarine "Christmas tree" flashed red and green lights at him: autopilot on, computer circuits warm and ready, control circuits green, gyro running and on track, radar in sync with ground stations, telemetering ready with filaments on, power plant and pressures normal, and ship still on external power. He fastened on the pickups which would telemeter his body responses back to the ground.

The ceiling speaker rasped, "Minus-ten minutes! Mark!" Then another voice cut in, "Hello, Dick, this is Don."

Dick put on his earphones and switched on his throat mike. "Go ahead."

"Any troubles?"

"Not yet."

"O.K. I'm here in Control if you want to talk."

"Thanks." Karlter would never know, perhaps, how much Dick wanted to talk right then. But the pilot put

down the desire and went to work running down the check list in an effort to keep busy. He didn't want to stop and think about why he was doing this. The check list did not last long. The ship was working perfectly, and he whipped through as though this were a mock firing.

"This is Project Control. Minus-five minutes! Mark!"

Five minutes. Funny how five minutes could change a man's life. It was a certain five minutes that had changed his and were responsible for his being in the *Nomad* right then: that night he'd come back prematurely from a test flight to Australia. In his own house he'd found a nasty situation, hard words, then screaming anger. It was not that he'd never suspected, but because he'd been a fool for telling himself he was wrong on those long sub cruises, during the long waits of carrier battle problems, and in the midst of the long, curving trajectories to the other side of the ocean.

"Minus-four minutes. Mark!"

Well, if she wanted it that way, he was willing to free her. He'd never been able to give her the things she wanted in marriage anyway, no matter how hard he tried. She'd have been better off with a nine-to-five businessman and a cozy house in the suburbs. A naval officer's life wasn't like that, and a test pilot's even worse.

"Three minutes!"

O.K., she'd get her way — except

with his son. Tommy was going to be free to choose his own way of life, if he had anything to say about it. That had been a bone of bitter contention for a long time, and he would settle it once and for all. Sure, it was natural for her to try to find in Tommy the things absent in the father, but she was wrecking the kid's life by forcing him to do something he didn't want. It made him burn to think of the emotional blackmail she'd used.

"Two minutes! Stand by to fire!"

He made another quick check of the Christmas tree; all green and red in the proper places. A quick test of the guidance system before he locked it into the autopilot. This was the real thing now. Months of testing and practice, and now the pay-off. But he could still back out. The ship was on the ground yet. He wondered if it was worth getting killed for what he wanted. Well, if he backed out, no money; life wouldn't be worth living then. He wasn't so sure it was anyway.

"One minute."

The *Nomad* was ready. "Project Control, *Nomad* secure for lift," he addressed the mike.

"Forty seconds!"

He started the pumps and activated automatic circuits. Lights winked on and off on the Christmas tree.

"Thirty seconds!"

The ground power plug dropped free, leaving the ship running on its own. Dick poised his finger over the autopilot switch, ready to turn it on if it

failed to do so on the trigger pulse from the blockhouse. The *Nomad*, silent a few minutes before, was now alive and humming, whirring noises.

"Fifteen!"

The *Nomad* was suddenly a being bent on killing him. It was too late to run; he had to stay and fight.

"Ten . . . nine . . . eight . . . seven . . . six —"

The autopilot came on. He braced himself for the take-off.

"Three . . . two . . . one . . . FIRE!"

It hit him. Incredible noise beat against his ears and shook his body. A tremendous shudder went through the ship. The push which flattened him into the couch was not the sudden jar of the familiar transocean rockets, but an increasing force which tightened the skin across his face and tried to shove the breath from his chest. He had the sensation the ceiling was falling on him; he wanted to hide, but didn't know where. The noise was no longer sound; it was pain.

He fought back. He'd live in spite of what the *Nomad* tried to do—if the gyros didn't fail. They had to track—*had to!*

The earsplitting roar died as the ship rammed past the speed of sound. The radar screen showed she was beginning to tilt to the east on orders from the programmed autopilot.

There was a sudden push of acceleration. Step One was separating. He

watched it fall behind on the radar-scope. Dead weight now, its fuel expended, it would rise another hundred miles on its own momentum. Where it would fall was no concern of his. He watched the ship being tilted ever more to the eastward.

The incredible heaviness persisted. Dick kept his eyes glued on the Christmas tree, watching the gyro indicators, his hand over the manual cut-off switch. There were still minutes left where the ship could go haywire. She could still kill him in very nasty ways. His only chance was to be able to move and think fast if something did happen.

A red light winked. He tensed, but it was only the warning for second separation. He felt the concussion as the nose of Step Two blew into two sections, and he knew that Step Three, the sleek, rocket-powered flying boat in which he was riding, had roared out of the ungainly, bulky mass of titanium and aluminum of Step Two like a moth emerging from its cocoon. He would have liked to have seen a sight like that.

Lights across the board were solid green again, with the first spaceship on its own. Radar showed Step Two receding, and it was less than a minute to final cut-off. The autopilot was now shaping the round-the-world course.

The red hand crept slowly around the face of the chronometer. Thirty seconds to go . . . twenty . . . ten . . . five . . . four . . . three—

The gyros tumbled.

The panel-lights told him before he felt it. He jabbed frantically at the cut-off switch, but the electronic autopilot had a faster reaction time.

There was dead silence. Dick's stomach was suddenly wrenched against his ribs, and he found himself hanging on his straps. He ignored the little light which belatedly announced "Cut-off," and reached for his mike switch.

"Hello, Control! Hello, Control! Don, answer *Nomad*!"

"Hello, Dick," Don's voice came back exuberantly. "Man, oh man! We're still tracking you, and you're right in the groove! You should have seen that take-off! You did it!"

"I'm in trouble," Dick cut in, trying to hold the panic in his voice. "Something happened about two seconds before cut-off. It looks like my gyros are gone."

"Wait a minute . . . Bahama Radar reports your beacon intermittent." Don's voice had lost its exuberance. "Are you tumbling?"

"Wait one. I've got to get a look at things." That was what he said, but not what he wanted to do. He was on the knife edge of panic; something had happened, and he was not sure what. He had to get his bearings, calm down, find what was wrong, and try to fix it. The only thing he knew for sure was that he was still alive. He struggled to get a grip on himself.

The straps were beginning to hurt,

ASTOUNDING SCIENCE-FICTION

and he discovered he was hanging on them. The control room seemed to have turned upside down. He checked the radar screen and saw the Earth wipe across it periodically. He timed the reappearance of Bahama Radar as its beacon wiped across the screen.

He knew then. The last second of firing after the gyros tumbled had given just enough misdirected push to throw the ship head over heels. The autopilot, without reference to the gyros, had been powerless to correct it.

It was also evident why the room had turned "upside-down." The end-over-end motion of the *Nomad* about her center of gravity produced centrifugal force along the long axis of the ship. And since the control room was normally forward of the center of gravity, this pseudo-gravity of rotation was in the wrong direction in the control room, giving the compartment about one-half Earth-normal gravity directed toward the former overhead.

Dick called the ground and explained that the ship was in a ten-second tumble.

"Can you get it out?" was Don's anxious question.

Dick said it would be tough with the gyros tumbling too and nothing with which to re-align them. "Give me an orbit calculation," he told Don. "If perigee is inside the atmosphere, I'll have a chance to straighten her out aerodynamically."

He held the line while those on the ground gathered radar data. Don

finally answered, "The computer says you're up there to stay—unless you can do something about it."

Doing "something" meant killing the *Nomad's* orbital velocity of over four miles-per-second and spiraling back to Earth. He had to fire the jet in the precise direction at the precise time to do it. With the *Nomad* tumbling as it was, he knew that was impossible. He was up there to stay until he, or someone on the ground, figured a way to get down.

He tore the telemetry pickups off, crawled from under the straps, and dropped to the "floor." Ten minutes later, Project Control swung out of line-of-sight around the bulge of the Earth, and he lost communication with Don. There was over an hour to wait, since radar indicated the *Nomad* was in a two-hour orbit slightly more than a thousand miles above the surface.

A mere thousand miles! Why, Karlter's transocean rockets covered that distance in a matter of minutes. But this thousand miles was the roughest thousand in existence: straight up.

He got aft to the gyros. They were tumbling, all right, and therefore useless. He disconnected them from the autopilot.

The *Nomad* was still out to kill him, he thought. In twenty-four hours, the oxygen would be gone, and the ship would drag the last bit of gasping life from him. He had to get out of this mess before that.

"Think, man, *think!*" he cried to himself. It was an engineering problem of stopping a tumble in a free system. He knew he could solve it if he tried.

Or could he? He didn't have much to work with.

The Earth wheeled by the port, and he stopped for a look. Through the vacuum of space, he saw it as no other man had. It looked close enough to reach out and touch, every feature on the surface standing out boldly. The *Nomad* was swinging north over the East Indies at dawn, and myriad islands dotted the dark ocean. The continent of Australia was just visible to the south. He wanted very much to have his son see this.

Dick had spent the weekend with the lad, and they'd talked rockets incessantly. Tommy was enjoying Baird Point Academy with its naval traditions, and was looking forward to Annapolis, Caltech, and the years in the Navy Rocket Arm which would follow. Tommy wanted Space and rockets, and wanted them with a seriousness of purpose unusual for a fourteen-year-old. It was a rugged life with chances of its being short, but the boy wanted it. Well, if he wanted to pioneer, he'd learn like his dad that pioneers don't go wholly because they want to. They get pushed.

Now that Dick thought about it, he saw that he had to get back down. The courts would give Tommy to

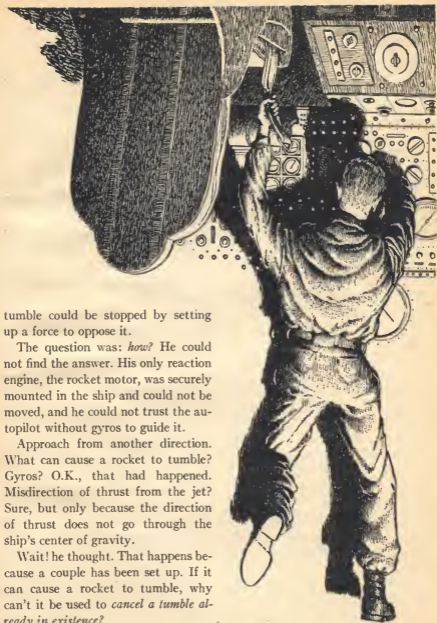
Ellen automatically if he didn't, and she would then control the purse strings for Baird Point. Even the letter he'd left for Don Karlter making the industrialist his executor, would have little effect; Don could not get guardianship. Tommy would get yanked out of Baird Point at once. He recalled how hard the two of them had fought to get Ellen to give in to the idea of Baird Point and what followed. Ellen did not want Tommy away from home. More important, she did not want him to follow in his father's footsteps. Ellen had ideas of her own: Harvard, perhaps, and then law school. Tommy was to become someone she could be proud of. He would own a fine home, have fine friends, make lots of money, belong to the best clubs, and be in charge of a fine business.

But Tommy had rockets on the brain, planets in his eyes, and a slide rule in his pocket already. Well, maybe he would see more than just the Earth; maybe he'd walk the barren craters of Luna and drink the canal waters of Mars. Yes, he certainly would, if his father had anything to say about it.

So he had to return. There was more than money involved after all. He was going to have to fight the thing through personally.

"O.K.," he told himself, "problem. Solve it."

Gyros gone. No way to kill the tumble by precessing them. Action and reaction were the only things left. The



tumble could be stopped by setting up a force to oppose it.

The question was: *how?* He could not find the answer. His only reaction engine, the rocket motor, was securely mounted in the ship and could not be moved, and he could not trust the autopilot without gyros to guide it.

Approach from another direction. What can cause a rocket to tumble? Gyros? O.K., that had happened. Misdirection of thrust from the jet? Sure, but only because the direction of thrust does not go through the ship's center of gravity.

Wait! he thought. That happens because a couple has been set up. If it can cause a rocket to tumble, why can't it be used to *cancel a tumble already in existence?*

Could he, by redistributing the mass in the ship, set up a couple by firing the jet? There was 23.8 pounds of trim load aboard, as well as nearly twice that replacing the weight of the stand-by gyro unit. He had nothing to figure with, no pencil, no paper, no slide rule. He looked at the chronometer; five minutes, and he could ask Don and the boys on the computer downstairs.

They gave him the answer; it could be done. They told him where to move the sandbags and how to place them. They figured how long he would have to fire to break the tumble; it was not much, but it would give him less fuel reserve for breaking out of his orbit.

Two hours later, on his next circuit of the globe, he reported ready. Then he ran into more trouble.

"Don, I can't get back in my control couch."

"Huh? Why?"

"It's on the ceiling, and I'm not a human fly. I can jump and grab the straps, but I can't get in even by chinning myself."

"Great Scott, that's right! Your end of the ship is 'upside-down,' isn't it?"

"Look, is there any way I can fire from somewhere else? I'd do it while hanging from the straps, but I can't land this streamlined anvil if I get bashed around breaking out of this mess."

"Dick, this is Chuck Streiker," another voice came through. "Can you get everything set up for the firing?"

"Sure. I can hang by one hand and set the controls on the board."

"O.K.," the project engineer went on, "move the following sandbags." He listed them. "Then, take off the panel labeled *Firing Circuit Control*. There's a relay in there marked *R-23*. Tear a bit of friction tape off a connection somewhere and put it between the relay contacts. *Make sure it stays there!* Then set up your board and punch the firing button. If you fixed the relay right, the jet won't fire just then. After that, wedge yourself in between the autopilot and the approach radar, and yank out the tape. Got that?"

"Roger."

It took him a few minutes to fix the lash-up. Then he jumped for the couch, set the controls while hanging like a monkey, and paused.

What if he hadn't insulated all the relay contacts? If the jet fired while he was still hanging, he'd be mashed into something resembling tomato aspic on the control room walls.

He couldn't push that button — he just couldn't. It was like pointing a gun at your head and pulling the trigger, even though you knew you'd just unloaded the chamber.

But it was a matter of taking the chance, or staying up there to die.

He decided he didn't want to die after all, and that he would fight this ship down. He was going to be one test pilot who came back from his last hop. Besides, Tommy was waiting and he

didn't want to let the kid down. He pushed the button; the jet did not fire.

It was not easy to wedge himself in by the autopilot. There was just no room for one leg, so he had to rest it on the floor. Taking a deep breath and bracing himself, he yanked out the friction tape. The contacts sparked and completed the circuit.

There was a sudden, nauseating pain that shot clear up his side as his leg was snapped violently around by the acceleration. His scream was drowned out by the rumble of the jet resounding through the ship.

Then, silence with the stars barely creeping across the port. The few seconds of firing had slowed the tumble until it was minutes in duration.

Even though he was now weightless, the pain in his left leg was unbearable. He had to fight to stay conscious. There was a strange lump on his leg as it dangled there at an unnatural angle. The bone of the compound fracture had pierced the skin but not his coveralls. The pain, coupled with the weightlessness, caused a wave of nausea to wash over him. He vomited. Then the stench made him vomit again.

Weak and dizzy, he managed to float to the mike switch. "Hello, Control. Hello, Control."

"Are you out of the tumble, Dick?" Don asked.

Dick swallowed hard, trying to forget the lashing waves of pain. There

was a terrible taste in his mouth; he wanted some water. "I . . . I think so . . . but I busted my leg bad."

"Can you get her down in the shape you're in?"

"I don't know . . . I don't see how . . . but I'll try—"

"You'll have to move the sandbags again. Can you do it?"

He did, somehow. He did not know where the strength came from. He moved in a haze. The sandbags still had inertia, and required something to move them. He felt better after he got back to his couch and adjusted it so he was in a sitting position. He contacted Don again. "Get me down!"

"The Pacific suit you?"

"Pick an ocean—any ocean—but get me down on one soon! I can't hold on much longer—"

"We've computed for Hawaii. The Navy's standing by for you. If you want to get down on this time around, it's minus-ten minutes. Are you ready?"

"I can't hold out for another round," Dick mumbled. "Shoot the works. Now or never. I'll get her in."

"O.K., boy, you're the pilot," Don replied easily. "Minus-nine minutes! Mark!"

Those nine minutes were even longer than the lift count-down. He wished he had some morphine, barbiturate, anything. His leg throbbed, sending lancing arrows of pain up his side.

Other worries began to pop into his mind. Would he hit the Asiatic mainland instead of the ocean? Were Streiker and the computermen right? Well, they knew more about it than he, so they *had* to be.

The time came. He delayed firing five seconds until the still-slightly-tumbling ship came to the proper altitude. Tears filled his eyes and he cried out as the acceleration jammed his leg into the pads. He hung on the bare edge of consciousness, fighting with everything he had.

Then the little green "Cut-off" light winked again. He watched the radar altimeter; at first it didn't move. Then it slowly started to unwind. It passed the 1000-mile mark, edged on over to the 950 mark—and kept going. He was on his way down!

"Fine business," Don reported. "The first checks show you're within a few per cent of your calculated groove. How do you feel?"

"I'll make it."

The flight program called for him to flip the ship back around the gyros, but he had to wait for the fins and the atmosphere to do that job now. The *Nomad* was slowly slipping back to *terra firma*, tail first.

As the ship swung around the dark portion of the globe, he could see Cape-town glittering off to the left. He caught the sunrise line near the east coast of Africa, then swept out over the Indian Ocean. The radar said six hundred miles, falling rapidly.

Hold on, chum, he told himself. You're not hurt as bad as you think. You'll get this crate back down. You're almost there. You're going home to finish the job.

As he thought about it again, he gritted his teeth bitterly. Well, it had been his mistake to start with. She was no Navy wife. She was always determined she was going to have a say in things: his life, his work, his son, and his son's life. She was the kind who always wanted to run things. Not "whither thou goest," but "whither I think we ought to go." He forgot the pain in his leg as he remembered the petty bickering; the day he pulled a botch on a test job and was nearly killed because he'd fought half the night with her; the iron-clad edicts on what he could and could not do; how he must not mess up the ash trays in the living room because they were for guests; the lurking fear that he might not say the right thing; the way she wheedled Tommy to get her way with him; the nights her emotional blackmail had caused Tommy to leave the table in tears, unable to finish his supper; the repeated statement that maybe Tommy would amount to something if he tried and took her advice.

Tommy *was* going to amount to something, but not what she thought. He would grow as straight and tall as the rockets he would fly to the far places and worlds. He would be doing what he wanted. He would not be held

down nor directed. He would make his own decisions, and Dick would back them up as long as he could.

Three hundred miles. Borneo ahead, just peeking through the mist on the curved horizon. As he swung out over the Pacific he spotted weather ahead. But the *Nomad* wouldn't take rough seas. He was coming in dead stick, and had to have smooth weather. The Pacific is a big ocean and the bad weather was behind him in a matter of minutes. His approach rate was beginning to increase now.

Down and down in a shallow curve went the *Nomad*—tail first. New Guinea whisked by to the south.

At fifty miles altitude, Dick wished he had a towel. He was dripping with sweat, and the cabin was getting uncomfortably warm. Atmospheric friction was starting to build up the heat of the *Nomad's* skin.

He awaited the flip-over with apprehension. Would the ship turn around naturally when her fins took hold, or would the strain snap her in two? Twenty-five miles up, he got the answer. There was a slight shudder through the ship, and something groaned. From aft he detected a vibration; high-speed tail flutter. Must correct that next time, he thought.

The flip was slow and graceful, the *Nomad* coming about easily. Nose first and with the full effect of her streamlining, she darted downward. The cabin grew almost intolerably hot, and

Dick watched the leading edges of the wings grow cherry red with the heat of the shock wave. When the *Nomad* started to yaw violently at fifteen miles, he was ready for it. It was nothing new to him. He fought it by hand, not trusting an autopilot without gyros. The pain in his leg made him groggy, and he wished he'd been the hundred-and-first man into space instead of the first.

At one hundred fifty thousand feet, he was still making several thousand knots and trusting the lower strata of air to kill that speed for him. But at seventy thousand feet as he was jockeying to kill more speed, a heavy bank of clouds swept over the horizon toward him. Typhoon!

The *Nomad* could not hope to plunge through even the upper parts of a disturbance like that and come out in one piece. He hauled back on the wheel. The *Nomad*, still possessed of a speed near Mach 2, climbed sharply. He blacked out, and fought his way back to consciousness through a red haze of pain and nausea.

The *Nomad* arched easily over the typhoon area, clearing it by several miles. When Dick nosed her down again, she assumed a much sharper angle of dive. He let her go, fearing a high-speed stall if he tried to stretch the glide.

As he came in to look for a landing spot, the Pacific was living up to its name. The water was glassy with only a few gentle ground swells.

He was doing over three hundred knots as he flared the ship out for a landing. The first contact was merely a bounce. In a shower of flying spray, the *Nomad* carcened off the water like a skipping stone, leaped several miles, then hit again in another tremendous splash. Five times the ship did this, with Dick fighting her all the way. It finally got on the water and stayed there.

Two Navy jet flying boats which had been tracking the *Nomad*, were there almost at once. They wheeled around and dropped to the water like great blue cormorants.

As the *Nomad* heaved up and down on the gentle swell, Dick relaxed and let the pain wash over him in great waves. I've won, he thought, and went out cold.

Karlter and Streiker were waiting for him when the Navy rocket glided in at Muroc. Don rushed him away from the newsreels and TV pickups to a waiting stratoplane. As they winged their way across the continent, Don grinned and asked, "How does it feel to be the first spaceman?"

Dick rested his cast on one crutch and drew deeply on a cigarette. It was good to be able to smoke again. "I'd rather have waited and bought a ticket."

"Man, you're the Lindbergh of the spaceways! Do you know this whole screwy country is slightly space-happy right now because of you?"

Dick shrugged. "So what?"

"So you did it successfully; you proved it could be done! The President's going to decorate you. You're slated for three TV-casts and magazine spreads. Congress—"

"Cancel them!"

"Huh? Wait a minute, Dick—"
Don objected.

"I said: cancel the works! I don't want to do anything for a couple of months; I'm tired." He was, too. He felt as though every last bit of strength and emotion had been drained from him.

"Look, lad, we're going to need this publicity," Don explained. "It's appropriation time in Congress, you know, and the Navy, and ourselves, are going to need money. We've been given the green light by the Navy to develop a space station."

"We're starting on a series of orbital rockets first," Streiker explained. "We've got a new trick up our sleeves this time: the Naval Aircraft Factory and DuPont have come up with a method of taking standard fuels, adding a catalyst, and getting fantastic exhaust velocities! It's all been secret stuff and came out too late for the *Nomad*. We had to go ahead with what we had."

"So? Why tell me?"

"Because you've got more on-the-spot experience than any other man. You're needed on the next project: space station with single-stage shuttle rockets — and good gyros! You can

write your own ticket!" Don looked dog-tired, but happy. "How does that sound?"

Dick watched the smoke curl up from his cigarette. "I told you, Don, that from now on I'm just a spectator. Somebody else takes it from here. I wouldn't do it again for anything. I'm through."

"But, Dick—" Don began. Streiker sat up and looked worried.

"I said I'm finished!" Dick snapped angrily. "I don't want to talk about it! What are you trying to do, make me out as a hardy pioneer? Nuts! I did a nasty job because I had to! I'm through! I'm . . . tired—" He said this last with utter weariness in his voice. Snuffing out his cigarette, he went on, "May I use your phone?"

"Sure." Don handed him the strato-plane's radiotelephone.

Dick dialed a New York number and waited. A voice at the other end answered, "Dodds and Carlson, attorneys at law. Carlson speaking."

"Carlson, this is Dick Crowell."

"Oh, yes! Congratulations, man!"

"Save it. I'll be in your office tomorrow with a check for fifty thousand. In the meantime, pay Mrs. Crowell what she wants, but get me the custody of my boy, do you understand?"

"Uh, Mr. Crowell," Carlson's voice came back worried, "I talked with Mrs. Crowell's attorney a few hours ago. She is reluctant to part with her

only child. Now, these custody cases usually take quite a bit of money to settle out of court, you know, since the court usually awards the child to the mother. Now, I talked the other party into a settlement, but they were unwilling to take your price. They wanted a hundred. I managed to talk them down to eighty-five, which is as low as I think they'll go—"

Dick listened to this in stunned silence, suddenly feeling very tired and discouraged.

"Now, this is my advice . . . Hello, hello, Crowell! Are you still there?"

"Uh . . . yeah, I'm here . . . You think I'll have to meet that price, then?"

"I don't think she'll settle for less. Now, my advice is to take that offer before your publicity doubles it. This flight of yours gave you notoriety which would complicate—"

"O.K., O.K.—" Crowell mumbled, then breathed deep. "Tell them O.K. I'll get it. See you in a few days—" He returned the handset to its cradle gently, then sat looking woodenly at his cast.

"Bad news?" Don asked.

Dick nodded slowly. "Got a drink aboard this crate?"

"What will you have?"

"A strong one." He sat in silence, watching the Arizona desert slip beneath the plane, until Don returned and handed him a glass. The pilot drained it, reached for another cigarette, and tapped it against his thumb-

nailed. "Dick, what's it worth if I take up the next one?"

"Change your mind?"

"Yeah."

Don studied the little five-foot pilot intently for a moment. He liked this miniature version of a man for different reasons than the rocket engineers. He was a man for all his small stature, regardless of what Ellen had ever thought. "I'll make it worth your while, chum; we need you. Why not come and talk this thing out with me when you feel better?"

"Thanks," Dick said simply. He thought, how long is this going to go on? How far am I going to get pushed? He remembered that Columbus made three trips and never did manage to get out of hock.

"Forget what I said earlier," he went on. "I'll go along with the hoopla campaign. Just let me take a few weekends at Baird Point. And that letter I gave you—"

"I never opened it. I knew I wouldn't have to."

"Keep it. Some day you'll have to."

THE END

THE ANALYTICAL LABORATORY

In the May issue, with a much heavier vote than has been usual in the past, the bonus-places are still definite. The score ran as follows:

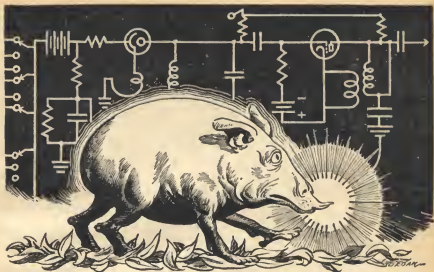
PLACE	STORY	AUTHOR	POINTS
1.	Mission of Gravity (Pt. 2)	<i>Hal Clement</i>	1.94
2.	Medicine Show	<i>Robert Moore Williams</i>	2.70
3.	Operating Instructions	<i>Robert Sheckley</i>	2.81
4.	Multifarious	<i>Algis Budrys</i>	2.83
5.	Lady With A Past	<i>Irving E. Cox, Jr.</i>	3.84

Your votes are a means to thank the authors who turn out a good yarn for your entertainment—and the thanks are very real. Hal Clement earned the 4¢ on the second installment of "Mission of Gravity"; and Bob Williams is going to collect an extra check for making second place.

The way the votes are going shows that one of the principle desiderata is tightly thought-out, highly organized ideas. The spectacular alone isn't enough; a clean, compact presentation is demanded.

We'll try to oblige!

THE EDITOR.



SHARE OUR WORLD

BY CHAN DAVIS

If one of the characteristics necessary for intelligence is organized thought, then any intelligent race must, like us, be highly organized individuals . . .

Illustrated by Orban

I.

"Hello, Chang! You owe us a report."

Chang Kwei-T'ao looked up at the grinning brown face of Tim Balch, who stood blocking her way down the ship's corridor. "I know," she said,

"I'll make up a schematic for you within —" She broke off. "On second thought maybe I won't. That wasn't a very friendly greeting, considering."

Balch looked down at her, grinning wider. "Considering what?"

She hesitated. "Considering that you owe me a report, too."

"I just finished making one up; it should be in your lab by now."

"And so you come running to pester me for one!" She shook her head. "After three months I should be used to you, but I sort of hoped you'd reform once we hit our planet."

"I didn't run to pester you," he protested lightly. "I met you in the corridor by purest accident."

"No."

Balch laughed. "All right, it wasn't an accident. I have something to show you, and I was heading for your lab when I met you. See? I may mystify you, but I always—"

"You always make sense in the end," Chang finished. Immediately she felt his embarrassment and was sorry. "What did you want to show me?"

"Come on down to the air lock, you'll see."

They walked slowly down the corridor together. The main air lock was two levels down, but even here they could tell it was standing open. Planet air always smells different from ship's air. You can't tell the difference so much when it's being sucked in by the ship's blowers, but when you leave the air locks open the distinctive smells of the planet reach all parts of the ship. Chang breathed in the faintly ammoniacal air of "Four" happily. She felt suddenly that the ship, which had been merely a vehicle during the trip from the Procyon system, was now a home. She was trying to think how to

say this to Balch when he spoke.

"How's your nibbly?"

"My what?"

"Your nibbly. In your lab."

"Why do you call the animal that? We gave it a perfectly good name."

"Yeah. He just looks that way to me. You know. Squats with his long nose stuck out in front of him and—wiggles it just a little. Eats a little, takes a couple of steps, then—wiggles his nose some more."

"I know." She smiled. "I like them too. But I don't understand them."

"Can't speak the language yet."

"Maybe that's it. I don't know."

"Maybe the specimen I got you just happened to be a nibbly moron. What makes you so sure the nibblys are intelligent, anyway?"

"I'll discuss that in my report when I make it out."

"Now don't be coy."

"Look who's talking!"

Balch laughed. "Well, this item I'm taking you to see might help with that very question."

Chang didn't answer; they were at the ladder. They went down in silence and there was the air lock, opening on the forests of Four.

Chang sat down on the edge, laughing a little in her excitement. It was just ten of the local days since this planet had been seen by men for the first time! The Joneses and Balch and she and the rest of them had come, and here they were, and here was this

world. She accepted it, she loved it, even though she had seen no more of it than what was visible from the ship.

There wasn't much to see. The sunlight was sharp and bright, and a little bluer than she was used to. Below her spread the clearing in which the ship had landed; around it the shimmering forest rose up so high that from here she could see very little of the sky. Just the face of the forest, pale, misty, and blue-green, and motion everywhere—waving, fluttering, darting, rippling, but always motion. All the flying things here were small, in spite of the high air pressure; they did not travel straight, but flitted back and forth through the vast complexity of the forest.

"I like this planet!" said Chang, in a tone more subdued than she felt.

"I *love* it!" Balch's laugh sounded as if he was embarrassed by his own enthusiasm. "I revel in it. Ranji and I will have to show you more of it some time."

"Oh yes, yes, yes, as soon as we can. It's—" She broke off.

"Better than home?"

"Better than Procyon II," she agreed.

"And it's the biggest job any of us could have."

"It was a wonderful world before we started and it'll still be a wonderful world after it's settled. What were you going to show me?"

He sat down at the side of the air

lock, where he could watch both her and the forest. "We'll have to wait some, I guess. Give them time."

"Who?"

"You'll see. Keep your eyes open; and speak softly, by the way. Am I being coy, Chang?"

"You certainly are."

"Don't you think, though—" He began again, seriously: "I do it as a joke, Chang. *You* really don't seem to want to tell me what you're doing. What do you want, the glory of solving the problem all by yourself? That doesn't mean anything."

"That's true." She didn't think that was what she wanted. "I'll tell you as I learn things."

"But let me in on the difficulties, too. It's so important. If we can communicate with the nibblies, it'll be tremendous. We'll understand the gross ecology of the planet in half the time, let alone—talking to a non-human! Chang, it's the most wonderful thing, it's the most important and exciting thing—"

"I know," said Chang, "that's my job." But she had felt so close and warm toward Balch while he was speaking; she had to say more! "I know," she said again desperately, "I *know*." For a moment she sat biting her lip.

"I shouldn't moralize," said Balch.

Chang shot him a grateful look, but he was watching the forest.

"How's your nibbly?" he resumed casually.

"Lackadaisical," she told him. "He just doesn't care much. I show him stuff visually; he looks at it and goes on eating. Yet I know sight is his most important sense."

"Wave lengths wrong?"

"No, I know it's not that. And he doesn't even seem particularly interested in his surroundings, that's the strangest part. He doesn't *investigate*, Tim. I don't expect him to start chatting with me, but he doesn't even pay much attention to me, or to anything else but food. A few times he's made a circuit of the wall of his room, sniffing with that active nose of his. I interpret this, for now, as loneliness."

"Maybe."

"But that's all. After two days of watching him do nothing, I decided I'd get nowhere unless I confronted him with an artificial problem. I rigged up a simple maze, with food reward and a light DC shock for failure. I was afraid he might feel insulted by its triviality, but after all, I figured, they're not extremely civilized animals."

"No bridges, no airplanes," Balch agreed; "not even any manual tools that we've seen. How did he do?"

"He did well, as long as there was only the reward and no shock. About as well as a padzid or an Earth rat, but different from either. He gets discouraged very easily, that's the best way to sum it up. But then I introduced the DC shock, and that was a bad idea. He touched the terminal

with his nose and it knocked him for a loop."

"Oh? That's bad. You should have started with a very small voltage and worked up, maybe?"

"That's what I thought I was doing, you see. Anyway, I switched to AC. At the same voltage it didn't seem to annoy him at all; I doubled the voltage and he was knocked out again."

"Think he's injured?"

"That's my worry for today. Hilda Streloff's coming up in an hour to look at him. I thought she might have some suggestions." Chang felt Balch's eyes on her; she studied the forest intently. "There's a lot more to tell, of course, even about his inactivity." Her voice trailed off, then—"Look! Over there!"

Balch looked where she was pointing. "That's what we've been waiting for," he said.

"The . . . the nibblies!" she said, smiling briefly at Balch. "Ten of them."

"Thirteen, in fact. Fourteen. This should be better for you than the movies Ranji and I brought you. Take a good look at how they graze."

"Don't worry, I am."

The nibblies were quadrupeds, over a meter long. In general they were a good deal like several non-predatory species from home, or from Earth and A Centauri, which Chang had studied; but several things gave them a dis-

tinctive "personality" in Chang's mind. Their round, tailless bodies led without the intervention of any neck into the sharp snouts with the peculiarly mobile tips. And their gait was unique. At every step their whole body would rise a quarter of a meter in the air, hind quarters first, then the front. This herd of them made quite a picture when they were all loping together in the same direction: a denser, green-brown wave rippling through the blue-green haze of the rippling forest.

For a while they grazed calmly. Chang could not see what they were eating, though she could make several good guesses. Then she thought they began to seem restless. She stood up and craned her neck to both sides, trying to get a better view. For a moment she thought she'd been mistaken, but then three nibblies detached themselves from the group and went off a little to the right. They loped from one of the slender "tree trunks" to another, stopping to nudge each one firmly with the sides of their round bodies.

With her eyes Chang followed several of the trunks up through the tangle of the forest, identifying them when she could. They were without horizontal branches. Also, like most of the large photosynthetic species on Four, they did not have single trunks; each tree stood on three or more approximately vertical "legs," which merged ten or twenty meters up.

Otherwise, she knew, such slender stems could never keep an upright position. They were intertwined with each other from the ground to the tree tops, and vines scarcely distinguishable from the trees climbed among them. Chang remembered Balch had told her of a section of forest which had apparently been blown down a while before, or simply fallen under its own weight; it was hard to see why it didn't happen oftener.

The three nibblies traveled in a figure-8, nudging trunk after trunk. Then they stopped and looked up, surveying the tangled braid into which the trunks led. (When they wanted to look behind them, they simply tipped their heads farther back instead of turning them sideways—a maneuver which delighted Chang.) Next they loped back to the rest of the herd.

"Balch, you've got plenty of movies of all this?"

"Plenty. There are a good many new ones in the report I just sent you. Relax."

The whole herd had gathered in a tight circle, facing inward so that the noses touched. They remained that way, motionless, for over two and a half minutes—Chang timed it. Then they dispersed.

Chang said, "Now, *do* they wiggle their noses when they have these huddles?" She giggled involuntarily.

"Can't tell; we've never been close

enough to them to know for sure."

"Four is a very strange planet."

Most of the herd withdrew a little into the forest. Three of them—the same three?—approached different trunks, among those investigated before, and began nipping at them with long pointed jaws. The rest stood aside and waited.

Shortly one nibbly left the trunk he'd been working on; it was partly gnawed through, but Chang couldn't see how deep the gash was. Then another left his work to stand with the rest. The remaining one kept at it for over half a minute longer. Chang noticed that the trunk he was gnawing did not belong to the same organism as the first two.

There was a sudden sharp crack, then seconds later, several more. On the ground, the nibblies were all in one group again now. They stood calmly and watched. Twenty meters above them, the great plants swayed and lashed in a complex pattern, which abruptly became simple: the two which had been severed disentangled themselves, as if deliberately, and slipped down, depositing themselves noisily on the forest floor. The remaining plants swayed a while longer, then subsided.

The nibblies scattered themselves among the ruins of the trees they had felled and munched quietly at the long slender leaves.

"No fuss at all," commented Balch,

as smugly as if he'd taught them the routine. "A few minutes' work, and down they come."

"How difficult is it?"

"Can't tell. Think we should try it ourselves to get an idea?"

"Maybe. You wouldn't want a whole section of forest dropping on your heads if you bungled, though."

"I think if we bungled the most likely thing would be that the trees we'd cut would just stay up there, supported by the others around them. We'll have plenty of chance to take movies of the process now, anyway, with the nibblies operating so close to the ship."

Chang started. "Say, that's right! When did they—"

Balch's smile for some reason irritated Chang. "Just so," he said. "The first three days, every herd Ranji and I got near in our helicopter would scatter so fast we couldn't get a good look. The fourth day after we left the ship—Day 6 after landing—we saw two herds, one in an area we'd covered before and the other far from here; they ignored us. Days 7 and 8, we landed and took movies and even one captive; they ignored us. This morning—Day 10—the nibblies seem to have decided the grass is green in our back yard. What made them change their mind?"

"Yeah. And how do they communicate such decisions from one herd to another—if they do?" She was going to go on, but realized some-

one else had come up behind them. She turned. Frank Streloff stood there with his hands on his hips and a nervous grin on his round, flushed face.

"Nice day!" he said.

"Certainly is," said Balch. "Here, it's always a nice day."

"So far," Chang added.

"Ah-ha! The pessimists we have always with us," said Streloff.

"Well," Balch drawled, staring contentedly at the towering jungle around them, "we don't have much reason so far for pessimism. Ranji and I have covered a considerable area without seeing more than two storms, both on the coast. We're leaving for three days in the winter hemisphere—"

"When?" asked Chang.

"Tomorrow. We'll see if the weather's any worse there. Shouldn't be much different; Four's axis is hardly inclined at all. We still don't understand this planet's climate, though. Why so little evaporation from the land? Why—Well, problems . . . that's what we're here for." He looked up at Streloff. "How are things with the biochemical crew?"

"Wonderful, wonderful," was the immediate answer. "Very good! Almost through with the secondary organic analysis of the soil—starting on some of the leaves in a few days. Our virus chains lasted out the trip perfectly."

Chang laughed. "A lot of analysis

goes on down there. One virus reacts to your sample, another virus reacts to the change in that one, another virus passes the word to you, and you make an entry in a notebook."

Streloff hesitated. "We encounter considerable difficulty with contamination and mutation," he said.

Balch asked quickly, "What are your results so far, Frank?"

"Very good, very many results. I don't have them all tabulated yet. We'll see, we'll see."

"Anything startling?"

"Well, I don't know if you'd say that. Not exactly. Oh, it's a fine day. Excuse me, I have to get back to my . . . er . . . assistants." He disappeared before they could say good-by.

Balch spoke first. "Why are you so hard on Frank?"

Chang started. "I'm sorry. What's happened to him, anyway?"

"He's been worried about his wife since before we arrived. Now that his work's going better he's burying himself in it to get back his good cheer—or try to."

"Worried about Hilda?"

"Hilda and Chandra Melkote—" He held up two crossed fingers.

"Is that true?"

"Don't think so, but that's what he's worried about."

"Indeed?" She smiled. "I'm supposed to be the psychologist in this party."

"Not this kind of psychology. This kind we all do. Keep what I said in



mind, huh?"

"Yes. Thanks."

She leaned against the side of the air lock and watched the nibblies, still eating quietly, just inside the edge of the forest. All fourteen of them. "It makes me feel lonely to sit way up here watching them," she said. "It must be cool down there." She looked up timidly. Balch's eyes met hers and he smiled lazily, then turned back to Four. Chang liked Tim Balch very much.

And it was very pleasant to sit here, in this green, sunlit well in the deep forest, and listen to the humming of this world's noon. "Even the air is good," mused Chang, remembering how her eyes had smarted the first time she'd breathed it.

Chang yawned happily, stretching out her legs to warm her calves in the direct sunlight.

At the same time she felt a sharp sense of incongruity. It let her finish the yawn, but immediately afterward she stood up with a sigh.

"Back to work," Balch stated.

"Yes." She looked around, torn between the fourteen nibblies down here and the one up in her lab. (He really must be lonely, she thought. How can I expect him to make sense out of that flat, glassed-in little room?) "Say, Tim"—she gestured toward the forest—"with the nibblies working so close to this clearing, we have essentially a cross section picture

of the trees they cut down. See what I mean? Maybe if we took movies from the ship they'd actually show the geometry of the trees; we could analyze the job mechanically and get some idea of what goes on in their collective minds."

"I get you. Might be worth trying. We'd need shots covering a good many of their lumbering operations, though, and they might not stick around that long. I'll talk it over with Ranji."

"O.K. I'll see you tonight."

"Wait!"

She whirled. "What?"

"Down there, to the right—another nibbly, and he's in a hurry!"

Behind the sunlit wall of leaves, in the rustling dimness, she could just make out the newcomer. He ran with his legs extended and his body high, without the fore-and-aft seesawing of the nibblies' slower gaits. And he ran fast, with his nose curled down.

The group they had watched before stopped grazing, but they did not scatter and hide. They stood calmly in a circle, as they had before, except that this time they made room for the newcomer to join them. They stood for over a minute with their noses together, shuffling a little in place. Chang kept her eye on the new one; when the huddle broke up, he was not the one who left it. One of the others dashed off, just as fast, in the direction from which he had come. As for the newcomer himself, he fell to grazing

with the herd—completely unruffled. Chang looked away for a moment, then back again; she couldn't identify him among the group of round, green-brown bodies.

Balch whistled softly. "Communications they have! Chang, you remember those quadrupeds we call wolves? From our second report?"

"Of course. You thought they preyed on the nibblies and other such vegetarians. Do you think this was a warning that wolves are in the neighborhood?"

"That's what I had in mind. But—"

"But why did one of our friends head back in the same direction? Why did the rest of them ignore the whole incident? Four is a strange world, Balch."

"That it is. We'll definitely take those movies." He stood up beside her. "Have that report ready before we leave, Chang. And don't be reticent." He grinned at her, then suddenly bent his face down close to hers, took her shoulders in his hands, and, staring straight into her eyes—wiggled his nose vigorously and solemnly, several times.

Chang pressed her nose to his and wiggled back.

II.

Tim Balch and Ranji Sumer had set aside that evening for looking at overdue reports from Chang and sev-

eral others, so they'd be briefed as well as possible before leaving for the northern hemisphere. The reports didn't come. The meteorologists gave them only a brief tape with two diagrams, showing information to collect on local thermal updrafts. That was O.K., but Balch was irked in spite of himself by Chang's note, which said, "No time, so no report. I have to nurse my nibbly tonight. Seem to be finding out something. This response to electric current may be important. Try to bring me back two specimens, one from nearby and one from the other hemisphere—if they're active there. If you haven't got anyone to take movies of the ones near the ship while you're gone, I'll do it."

"How do you like that?" said Balch.

"Terse, Tim; easily understood," smiled Sumer.

They had nothing else to do, so they made out a detailed plan of their trip; topical, not chronological, because they couldn't know in what order to do things when their knowledge of the terrain they were to cover was so vague. The drawing up of the plan was made the occasion for a thorough discussion. When they were done they sat and looked at each other; and simultaneously suggested chess.

On the eighty-day trip from Procyon this had been a major occupation for everyone aboard; in total man-hours it had easily surpassed all

serious jobs put together. It had also been the occasion for the first bad feeling between Chang and Balch. She'd said something to the effect that he didn't play to win, which after all was the object of the game, he was satisfied if he made a few ingenious combinations, and "when that happens it goes to your head."

He'd answered, "Well, Ranji says I get *too* involved in winning. Take your choice."

"I don't know, Balch, but there must be some reason why you never play a defensive game."

"Against you, I don't need to." He was sorry now he'd said that, it was sort of arrogant, but he didn't see why it had brought on such a grim silence. After that Chang had always stood by when Balch played either of the Streloffs or Judy Jones—the only people on board who beat him regularly.

From the arrival on Four till tonight, there'd been no chess games between Balch and Sumer, and probably none on the ship. *There was no time*. The ship was not capable of returning to Procyon. The one "non-velocity" message to there which they had the energy to send, they'd sent already; it had said that it was not necessary for rescue ships to follow them. Any further messages would have to go at merely the speed of light. So their program was this: Establish themselves on Four, find sources of food, minerals, and power; send back

a light-speed message calling for colonists to follow them; then simply keep themselves alive and try to transform Four into a world the colonists could settle.

It was a big job for their small expedition. And they had to hurry. The biggest need for speed was right now; their only food so far was what they'd brought, and they had not yet been able to get their own photosynthetic species to flourish properly on Four. Of course this difficulty had been anticipated before they'd left home, and most of the members of the expedition were biochemists of one sort or another. Non-biochemists didn't loaf, either. Mineral poisoning had to be avoided, also destruction by storm, earthquake, or native animal life, also—whatever else a totally unknown planet might produce.

There was literally a world of information which they should really have had before they came. If only that was possible.

So before they sat down to play chess, Sumer said, "Maybe we ought to ask Judy Jones if we can help."

"Or Chang," said Balch. "Well, from what they've said, I doubt if we'd do much good. Probably just get in their hair."

"I'll take your word for it. Well, we'll get more relaxation from a couple of games than from two extra hours of sleep. My turn for the white pieces."

They split two games. Midway in the second, Balch, while waiting for

Sumer to move, wrote a note to Chang: "Don't feel bad about the report, I knew you wouldn't get it done. Moreira's taking those movies, so don't you bother. We'll miss you while we're far away. Maybe the next trip you should come along. You won't convince me the nibblies are worth all the work you spend on them until they can beat me at chess."

III.

Chang took the compact metal case which was her movie file and slid it along its waist-high rack to the end of her lab. There she sat down before the schematic-taper Melkote had left in her office this morning. It was hers until she'd finished making out her report; then it'd be the turn of someone else on this level.

The function of the machine was simple enough. It was not possible for the other researchers on the ship to go through all the notes and movies Chang took each day; nor for her to summarize her results verbally in as much detail as Balch, Sumer, and some of the others would want. So reports—"schematics"—had to be made out, each in many copies. They had to be made out, and read, rapidly. No time should be wasted either by those who wanted a full picture or by those who were just checking to make sure there was nothing that demanded their attention. The schematic-taper was the report-writing tool.

Basically a schematic was a sound movie; so the taper had a mike into which you could talk, and a recorder which would incorporate into your report sequences of movie—sound or silent—which you had taken in the course of your experiments. Another useful technique was to draw diagrams with the stylus on the plate on the top of your taper; the drawing of the figures would be recorded as you went along, at actual speed or at any other speed you chose. A lot more can be explained this way than with static diagrams. If you wanted to include a static display, whether a diagram or a page of typescript, you could. When your report was done and someone reading it came to that point, he'd find the action—and the sound—had stopped and a still picture was on his viewer; when he wanted to go on, he'd press a stud on the right side of his viewer. Probably his hand would already be in position there, because there was another control on the viewer which was much used: pressing it would result in skipping, almost instantly, a whole section of the report. Of course these sections had to be designated by you when you were taping it.

Chang's report went like this:

First a *still*: a typed page, reading, "Chang Kwei-T'ao. Day 12. About the tapirinos—hereafter called NIBBLIES." There followed a string of code numerals.

Then another *still*. Type. "One herd of nibblies has been feeding near the ship since morning of Day 10. Movies are being taken."

A very brief silent *movie* sequence, from those Moreira had made, showing the nibblies' co-operation in felling trees. The accompanying voice was Chang's. She called attention to the appearance of communication between members of the herd, then ended, "Day 10 we saw nibblies apparently carrying messages between herds. Very important if true. The following section tells what happened. It is inconclusive." (Which meant, "Skip it unless you're specially interested.")

Movie. Diagram. Chang sketched what she'd seen, describing it orally as she went along. This took only about three minutes for Chang to record, and less than thirty seconds for the reader. *Section ending*.

Still. Type. "The rest of this report concerns the behavior of the captive nibbly. I would summarize by saying that the results are unexpectedly negative. No laboratory stimulus has produced such organized activity as free nibblies show. See my last report, Day 8. However, a peculiar physiological reaction led to discovery by Hilda Streloff and me of a large organ in the nibbly's head whose function is uncertain."

Still. Type. A table of contents of the remainder of the report, by sections.

Movie. from Chang's previous report, showing the nibbly characteristically ignoring his laboratory surroundings. Meanwhile Chang explained orally the maze set-up, and the reasons for trying it; ending, "This section merely discusses the results of the first series of maze runs."

Stills. Tabulated results of these runs, in parallel with typical results in the same mazes using rats and padzids. (These Chang got from her library.)

Movie. Several sequences of the nibbly in the maze, showing respects in which he did much less well than expected. *Section ending.*

Movie. Chang spoke a brief description of the set-up after the maze was fitted with electric contacts; then the nibbly's misadventures were shown. "We have not discovered that any permanent injury resulted." *Section ending.*

Movie. Diagram. A sketch of the nibbly appeared first, and other things were added as Chang described the experiment she and Hilda had tried after the conversation with Balch. The nibbly was put on a floor which would make a less effective ground than the one used before, then presented with a constant-voltage source at nose height; this was repeated using frequencies from thirty to five thousand cycles, and the impedance measured.

Still. Circuit diagram.

Still. Graph of the readings—impedance plotted against frequency.

Below it, written remarks: "You notice that from about one hundred cycles on up the impedances are very scattered. There's more of a pattern if you consider the order in which the readings were taken. The rest of this section shows the nibbly's behavior during successive readings, and the values we obtained."

Movie. The nibbly approached the contact with very little show of interest, laid his nose on it, took it away. "That's at thirty cycles, High impedance. The next few tries, at somewhat higher frequencies, were about the same. Now here's one hundred twenty cycles." The next few shots were of the nibbly approaching the contact with more interest, leaving his nose there longer; the frequencies Chang read off were higher each time, the impedances stayed low. "Here's four thousand cycles." There was a marked change in the nibbly's reaction: he investigated the wall all around before loping up to the contact itself; when he did, he left it shortly. The measured impedance was way up again. "After this, when the lower frequencies were tried again, the previous great interest was not observed; neither were the low impedances." *Section ending.*

"Summary: The ability of the nibbly to admit current over a considerable range of frequencies was lost. Apparently this was either a result of injury from the four-thousand-cycle current or a side effect of the nibbly's

loss of interest in the contact. Hilda and I decided to look for features of his anatomy which would account for the peculiar response to electric current. We used X rays and supersonics to map the internal organs of the head. This had not been tried before, and was not tried now for other parts of the body, because of the danger of injury to the nibbly. It was, of course, impossible to anaesthetize him; he allowed his head to be clamped."

The next section showed the results of these experiments; in the case of the supersonics, they were presented as a movie—an animated three-dimensional graph, you might call it—for the benefit of those skilled in surveying four-dimensional arrays of data by this method. There followed a somewhat conjectural sketch of the inside of the nibbly's "head"—which it turned out actually extended back into what looked like his shoulders. "The large organ at this point *appears to act as a condenser*. If so, its capacity presumably changed greatly in the course of our experiments. I will not make any more guesses now."

There followed only a still, repeating the table of contents, augmented by code numbers of the films which gave full details of the subject of each section. All Chang's reports ended that abruptly.

Chang stopped at the open door of Hilda Streloff's lab. Hilda and Chandra Melkote were there.

"Come in!" said Hilda, beckoning with her whole arm. She was a tall, strong woman, and her very athletic gestures always seemed to Chang like threats to anything breakable in the room. Chang sat down out of her arm's reach.

Hilda said, "Melkote was just starting up to see you. Blanca Moreira's been having trouble with him. Have you talked to her?"

"Not today," Chang admitted; "I should have. What's the disagreement?"

Chandra explained calmly, "Moreira feels that since the movies being taken of the tapirinos—"

"Nibblies, you mean," Hilda interrupted. Chang explained the etymology of Balch's name for the animals.

"Good! Nibblies. These movies she's taking for you, so she says, are so important that for me to work outside would be virtually sabotage. Hilda seems to agree."

"Work outside?"

"Yes. I'm introducing various Earth organisms, chosen for their probable viability on Fwur, into jars of Four organisms living as nearly as possible as if they were wild."

"Oh, yes, I remember. So you have to work out there?"

"Adjacent to the ship would be the most convenient place. The presence of natural sunlight improves the significance of the experiments, for one thing."

Hilda put in, turning her whole body around to face Chang, "But if he's out there, the nibblies won't stay there where we can watch them. What could be more important than that?" She turned back toward Melkote.

"Finding sources of food on Four," he answered firmly.

"That's where you're wrong!" She pointed a sturdy finger at him. "We'll find food; there's no danger there. But if we don't get to understand the nibblies, fast, they may decide we're interlopers, or we're stupid, or we're killing the captives we're taking, or anything; and they may never co-operate in getting to know us. Also, if they're *not* on the level where we can communicate with them, we want to know *that*. Maybe try these 'wolves' then, eh?" She looked challengingly at Chang. "We have to find out fast."

"But all this is irrelevant if we starve."

"This doesn't seem very complicated to me," Chang said. "Have you talked about it with Frank?"

Melkote started, Chang thought. "Not yet," he said.

Hilda snorted. "He'll say, 'By all means let Melkote proceed. Oh, by all means!' But he'll only say it because Melkote's results will help fill a few more gaps in the charts he's making."

Chang dropped the subject. "This is not very complicated," she mused. "After all, the nibblies haven't been paying any attention to us when we watch them, recently. And everyone



on the ship has been wandering around outside looking for samples of one thing or another. There's just nothing for Moreira to worry about."

"I would be spending almost half of the daylight hours outside," Melkote explained.

"Well, still. There's one more thing, though—the wolves."

"Oh? They haven't been seen in this vicinity. And in any case, I don't know why they should bother me."

"They eat things that move," said Hilda succinctly.

"And," Chang added, "if they haven't been around here, they will be, now that the nibblies are."

"I'm sure they can differentiate between me and food," smiled Melkote.

"Probably," Chang conceded. "But they might think we're competing with them for nibbly-on-the-hoof, and they might just decide we annoy them. I think it's safe, though. Leave the air lock open while you're outside, and the ladder down. Work only on that side, so the nibblies can still be undisturbed on the other side, if that's what they want. O.K.? O.K., Hilda?"

"Sure," she grunted.

"That should be satisfactory to everyone," smiled Melkote, getting up. "Peace," he said, grinning, and left.

"I'm sorry," said Hilda to Chang. "Mountains out of molehills! Frank's been giving me such a pain in the neck

I can't think straight."

"Frank?" Chang wondered whether to mention what Balch had said about him, but decided not to.

"Yes, yes, all this feeding samples to the viruses, purifying, irradiating, making notes—It's good work! He's a good worker! But you know what he wants to do after the colonists start arriving here? Develop new biosyntheses using the new microorganisms we find here. And you know where he wants to do it? Back on Procyon II. That's all he's thinking about."

She glared, waiting for Chang's reaction; but Chang was so stunned at the idea that anyone was already planning to leave Four that she couldn't answer. She was asking herself consciously for the first time what Balch was planning.

"It's a good idea," Hilda went on, "but look—We're opening up a new planet! Frank just has no perspective on this whole expedition!"

"Neither does Tim Balch," Chang said, to her own surprise.

The tone of Hilda's voice changed completely. "He doesn't? In what—You like him pretty well, right?"

"That's obvious."

"Maybe. He has the wrong approach to the expedition? In what way?"

"It's all a game to him," she burst out.

"But Chang, that's not true."

"Well, I guess that's not quite what I meant. I don't know why I said

that. Hilda, excuse me, but I had such a terrific idea while I was making out my report that I think we ought to go to work on it right away."

Hilda stared, then laughed loudly. "Steady down, steady down, Chang Kwei-T'ao! One thing at a time!"

"No, really, Hilda, I've been thinking about it all the time we've been talking, and I'm more certain of it than ever. Don't look at me that way, Hilda, you're being arch."

They both laughed. Hilda said, "Your idea is something you want me to work with you on?"

"Oh, yes, it's—"

"I'm listening."

"All right. The nibbly's head contains an organ which seems as if it must have a specifically electrical function."

"Or so we guess. Go ahead."

"The nibbly's most active sense organ, aside from his eyes, is the tip of his snout. At least he investigates with it most obviously."

"Doesn't investigate his food with it, just the walls."

"Yes," said Chang firmly, "the metal walls; and the live electric contacts especially."

"Right," Hilda broke in. "I've been thinking that you might try this next: see if electricity is conducted when you make the contact on any other part of the head beside the nose."

"Good idea," reflected Chang. "Just a minute, though, while I finish. Now the nibblies that I've seen free

have used their noses primarily for one purpose, as far as I can see: communication. Assuming this—how do they do it? By sound? That could be it, direct conduction of sound from one to the other, with too low volume to be audible through the air; but they don't have any sound-producing apparatus that we can spot. By simply wiggling their noses in code? I like the idea, but I think the messages they transmit are too complex for such a limited kind of language to handle."

"O.K.," said Hilda, "I suppose so. Your objections to those methods are pretty . . . er . . . speculative, though, and you don't have anything else to offer instead of them."

"Sure," said Chang, trying to restrain her triumph. "They communicate by *electric current*."

Hilda did not look thunderstruck. She sprawled down in her chair, feet apart, and muttered, "Now, do I believe that? They sure do use their noses. They react to current, maybe they can sense it. But, how could they ever produce it?"

"I don't think that's so incredible. There's nothing like it on Procyon II, but on Earth there are large animals that can give other organisms a pretty large shock, at will."

"Static electricity is one thing, alternating current is another."

"Yes, but Hilda, the nibbly can make a resonant circuit! He's got a variable condenser!"

"This begins to sound worth investigating." Hilda got up and began pacing the floor.

Chang went on excitedly. "Think of that poor nibbly in my lab! He lets himself be caught, and comes aboard, with no idea what he'll find, just hoping to find something about us and possibly get back to the rest to tell them. And as soon as he's aboard the ship—the ground starts trying to talk to him! Can you imagine what it'd be like? Quite likely he's never sensed electric current before except from another nibbly, and now it's coming from the ground all around him. Very faint, of course, but it's everywhere, just from the miscellaneous unshielded circuits around my lab. Whispers. No wonder he wasn't interested in the pictures I showed him. Would you be?

"And then we present him with the contact. He probably wonders why, if we want to talk to him, we don't just put our noses out. Remember he's not civilized, he'd be just as naive as human savages were. Nibblicentric. Anyhow, he decides at least we're going to talk with him. He's relieved; we're friends, not wolves. And then, not once but twice, we yell in his ear so loud it knocks him out. Still he keeps trying. He tries again and again to strike up a conversation with that contact, but all it does is say 'Ahh' at him, first a bass 'Ahh,' then on up to soprano. Finally he gets discouraged and makes up his mind he just

won't bother listening any more."

"Very good, very good, very good," said Hilda, running her hands through her shaggy brown hair. "Even better than that, if it's true. Now how can we get him to listen to us again?"

"Whenever we offered him something new in the way of AC, he was interested. What can we try next? No new frequency range, I suppose."

"Might be more to his taste if we didn't use a constant-voltage source; use a circuit that'll let our voltage drop off when he starts admitting current."

"More to his taste!" Chang jumped to her feet. "That's the idea. If we're going to communicate with him, we'll want to make our circuit as much like a nibbly as possible, electrically. And we'll have to—"

"Look, my friend," Hilda interrupted gently, shoving Chang toward the door, "when Wu comes back and I tell him I'm going to be working with you again, he'll want me to leave my stuff down here in comprehensible order. I'll be up to your place in half an hour; try to be stupid that long so I won't miss anything."

IV.

When Balch and Sumer got back, they landed the copter in the clearing instead of on the ship. This was so the two nibblies they had with them would not have to be exposed to Procyon-style air, but could be brought

into the ship via the lift in a tank provided with Four's air. (Four's air was all right for humans, but it needn't work the other way around. A trace of ammonia to breathe might be as essential to the nibblies as a trace of carbon dioxide to humans, or more so.)

They'd radioed ahead to this effect, so by the time they whirled to a stop there were already several people outside waiting for them. Chandra Melkote left his row of samples and came over to the lift, where Chang Kwei-T'ao, Blanca Moreira, and Judy and Issy Jones were waiting with the nibblies' air-box.

The copter settled onto its skids and the ramp was let down from the door in back. Out of the door came the tan face and stubby body of Ranji Sumer, then the brown face and lanky body of Tim Balch—then two nibblies, on leashes. The leashes and harnesses seemed unnecessary: the nibblies loped along behind the two men as docilely as if they'd been trained from childhood. The herd off in the forest unanimously stopped grazing to watch.

From the moment Sumer and Balch got out of the copter, Judy Jones was calling a steady stream of questions at them. They answered all of them with cheerful, emphatic yeses. Yes, they had plenty of maps made; yes, they had samples of soil and lake-bottom as various as you could want; yes, they had collected the data on

thermal updrafts and humidity over forests.

The nibblies were loaded into their air-box, where they curled up comfortably, interfering with each other a little in the cramped space.

Then the lift started up. It was simply a platform hung by four cables at the corners; when these were reeled in it retracted up into the ship. It was kept from swaying excessively, not by any guide rails, but by the cables themselves, which were not really cables, but narrow sheets of a ferromagnetic alloy, bent into the form of cylinders and held in that shape by their own magnetization. Inside the ship, at the top of the shaft, the sheets were demagnetized just below the drums, on which they were being reeled in flat. The next time the lift was lowered, they would be remagnetized as they left the drums, so that the edges would again snap together.

The group on the platform reached the top, blinking a little to adjust to the dimness of the ship after the blue morning brightness outside. Chang interrupted Judy's rapid-fire questioning for the first time: "The nibblies don't seem to be conferring. Did they do it at all on their way here?"

Balch said, "Not while we were watching. We didn't take movies of them in the copter. The one on this side is Rose; she's from about five degrees north of here. The other one, with the slightly reddish color around

the forelegs, is Felicia, from the northern hemisphere. And say," he added portentously, "we have *astounding* news about the nibblies."

Chang did not seem to be listening. She said, "They don't pay any attention to each other?"

"Well, no. I suppose they speak different languages."

"I wonder."

Balch, a little embarrassed, repeated his announcement as they wheeled the air-box off the lift. "We have *electrifying* news about the nibblies."

This got a response. "Electrifying!" Chang laughed, a little off-key. Melkote and Moreira grinned.

Balch was baffled. Ignoring the others, he started down the corridor with Chang, wheeling the nibblies before him. He looked down at Chang—the round, sweet face, the round, precisely perfect body—exactly his idea of Woman, but built on a reduced scale. He was acutely happy to see her, and acutely aware of her aloofness. "What's the matter, Chang?" he half-whispered. "You seem sort of dazed."

"I am. I've had a very strange experience."

"What happened?" No answer.

"What was it? Have you talked to the nibbly?"

"I don't know."

He looked at her, waiting for her to go on. All she did was to take hold of the air-box, slowing it down, and

point to the lab on the right. "In here," she said.

"But this isn't your lab."

"No. I'm parking them with Moreira for now. I don't have too much room, and I'm not sure I want to let them near the other one just now."

"Why not?"

"Because I'm not very confident of what he'd tell them about me."

"What would Brian have against you?"

"Brian? All right. I don't know—I just don't know what his opinion of me is. Before I put them together I want to talk it over with you."

"Why don't you talk it over with Hilda?" replied Balch in spite of himself.

Chang ignored the irony. "Hilda, too, of course. She's been working with me a good deal. She'll probably be at my lab when we get there."

She was. When they came in she stood up and greeted Balch loudly.

"How are you doing?" he answered.

"How's Brian?" He indicated the nibbly behind the transparent wall, who squatted in the familiar pose of indifference, staring blankly at them.

"Brian? He's fine—better than ever."

Balch, encouraged by her tone, turned abruptly to Chang. "Well, let's have it. Say hello to Brian for me in nibblian."

"I'm afraid the limit of my vocabu-

lary is 'goo goo'." She smiled faintly.

"Are you sure you're really communicating? How do you do it?"

She pointed to the fairly simple circuit she and Hilda had developed. It was spread all over the low table that stood against the transparent wall. Balch noticed a signal generator at the left end and an oscilloscope with two screens on the right.

"What's all that for?" he asked.

"That's the communicator." She went on, in a voice that sounded as if she was talking to herself, to explain her guess about the nibblies' "language"; how the nibbly had co-operated patiently while they took measurements and matched their circuit to his; how they had experimented with modulating their signals, and the nibbly had replied by modulating his; how they had decided to abandon their original theory that the nibblies' "code" was in terms of beeps at different frequencies.

Balch had listened with increasing excitement, and now he interrupted with, "Why'd you give that up? After all, that's the basis of our spoken language, and we use about the same frequency range."

"Well," said Chang, "two reasons. In the first place, the nibbly's receiving apparatus presumably detects the actual current flow directly, rather than responding to different frequencies separately the way our ear does. In the second place, the theory didn't get us anywhere."

"But you can't have tried it very long," Balch protested. "How far do you think you'd get toward understanding human talk in one day if you had to look at it recorded on a piece of paper frequency by frequency?"

"Not very far, it's true. But at least when you saw the same word in front of you it'd look the same both times."

"Not if . . . oh, let's say the first time it was 'two' and the second time it was 'a pair'."

"I know," Chang said wearily. "Synonyms. But we might as well keep trying different things until we get something. We tried assuming that the nibbly actually senses the *wave form* of a signal."

"And consciously modifies the wave form of the signal he sends out?"

"That's what we assume. But I don't know about the 'consciously' part of it; I'm not even sure that what he's doing isn't more analogous to a human's laughing when he's tickled." (Hilda snorted, muttered, "Pessimist!") "Also, Balch, the signal he sends out is the same as the signal he receives!"

"What!"

"He never sends except when I'm sending too, and then he always does. It's as if you were almost deaf except when you were talking to me, and almost dumb except when I was talking to you."

"A strange language."

"Very strange. This point is significant, Balch—of something."

"So anyhow," Balch encouraged her, "you must have got some results working on your second theory, if you can say all this so confidently."

"We got results of some sort," she said non-committally.

Hilda broke in impatiently. "You got *absolutely conclusive* results," she asserted, stabbing the air with her forefinger.

Chang smiled. "How do *you* know? All *I'm* sure of is that I gave myself the willies.

"Look, Balch. Here's what I 'spoke' with." He followed her over to the table. "We've got two of these now, but this is the one I used. A variable condenser and a variable resistance here, to adjust the fundamental signal. Here, I can cut in ten side circuits with non-linear response, to change the wave form. I haven't tried yet to use more than ^{four}four of them at once. This screen on the oscilloscope is to see what I'm sending.

"Here's what I 'listen' with. Simply a scope which gives me the wave that's passing between me and the nibbly."

"Simple enough."

"No, not so simple. I get something back from him, something complicated enough that it *could* be language, but not enough pattern. Balch, what can I do? I don't know the syllables, how can I learn the language? In fact, there aren't any syllables. I'm not a

nibbly, my instruments don't correspond to what the nibbly uses—well, not closely. All I can do is just throw my mind open and twiddle with the dials, waiting for something to happen."

There were tears in her eyes. Balch wanted to hold her and lay her head on his shoulder. Hilda's presence wouldn't have stopped him, but he didn't do it because Chang was still really speaking more to herself than to him. He said quietly, "Go on. What did happen?"

She leaned against the wall with her arms folded and spoke slowly. "Here are the things I'm surest of. I can make a signal which will get from the nibbly some comment about his immediate surroundings. I can't get him to tell me the number of sticks I have laid on the floor—at least, certainly not above six or seven. I can't get him to tell me anything that would indicate any abstract understanding of numbers. But, I can get him to tell me—"

"Geometrical facts!" Balch finished.

"How did you know?" she said sharply. - 1

"I remember the free ones outside—those tree-felling operations. They have to communicate geometry."

"That's right," Hilda and Chang said in unison. Chang went on, "You make me a little more confident that I'm understanding him."



"I know something else he'll be able to handle just as well, when we've got farther with him."

"What?" Chang was entirely alert now.

"Chess."

"What are you talking about, Balch!"

"I'll tell you later. You finish first."

"I've said about all. The only concepts I'm pretty sure I can both recognize *and* send are these: 'What

is near you?'; 'I approve of what you said'; 'Chang Kwei-T'ao' and 'Brian' (those are uncertain); 'regular tetrahedron' and a few other geometrical terms (those are even vaguer)."

"That's a lot!" Hilda insisted. "What do you expect in three days, telepathy and a nerve map?" Chang laughed. Hilda fainted alarmingly with her fist in the direction of Chang's head.

"No," Chang said stubbornly, "if

we've really got the method, and if Brian isn't a moron, we should have found more."

Tim Balch gave a sudden happy laugh; the two women turned toward him. "Three days!" he said. "I just realized. When I left you were still at the groping stage. Only three days! This is the way it's been ever since we got here. Every day here is worth . . . is worth ten ordinary years! It's such a terrific experience—"

Chang interrupted, coldly. "I'm sure the things you've done have been fun. It's been a developing experience for you."

Balch stood silent in amazement. Then he said, "It's true, darn it. Why do you say that? It's true. You like Four too, don't you?"

"Yes."

Hilda began earnestly, "Tim Balch, there's something wrong about your attitude toward—" She stopped. Chang was looking at her with open-mouthed horror.

"I don't understand," Balch admitted finally.

Chang looked at him. "It's time for lunch, let's go down. I want to hear your news about the nibblies."

"You don't want to wait till you see our movies?"

"No, I want to hear now." She took his hand as they went out into the corridor. She did it with more determination than affection, but Balch was relieved.

There was one more digression before Balch got around to telling his story: As the three of them were starting down to lunch, Hilda filled a silence with the offhand remark that the two new nibblies would probably be sending messages to Brian through the ship's electrical system while they were away. She interrupted herself, clapping her hand to her forehead, "Say, that's right! We really have something to offer them, don't we? *Metal wire*—give them that and they've got telegraph."

This called for a discussion, and they were eagerly interrupting each other every third sentence all the way down. Chang brought up the problem of writing: How could they ever invent an alphabet for the nibblies' strange language?

The ship's dining room was only an extra-size lab; it had doubled as recreation room during the trip from Procyon II, and was now serving as a workshop between meals. Most of the crew—twenty-five or so—was already eating when the three got there. Balch told his story with their whole table as audience.

He told it with the zest of the raconteur, but not well enough to avoid interruptions.

Sumer and he had stopped to watch two herds of nibblies feeding in a relatively open area. There was something about the herds' actions which was unusual. They'd hovered overhead in their copter for some time before

they'd spotted a reason: at least five wolves were in hiding, on all sides of the nibblies. The nibblies must have seen them, somehow; but they weren't letting on. "They weren't acting completely normal, they were responding to the danger in some way, but I still don't know what it was."

Blanca Moreira put in the suggestion that it might be possible to watch the behavior of the nibblies near the ship when and if wolves attacked them. Ranji Sumer responded right away: "I'll scout around after lunch; maybe I can see the wolves from the air before they get close."

Balch went on with his story. When two of the wolves had charged simultaneously, the nibblies had broken and run—but not at random. Several had disappeared abruptly, presumably into underground burrows. Three had stationed themselves motionless at tree trunks. The remainder had fled in what Balch was convinced was a planned pattern—"or else they improvise very fast!"

The two wolves were maneuvered into approaching the running nibblies both from the same side. Just as they were coming close, one of the giant trees fell lengthwise between them and their prey. One of the three "sappers"—the nibblies who had remained behind—had gnawed through the trunk by which he stood, at exactly the best moment. It looked as if the nibblies were out of danger.

However, the three remaining

wolves had closed in meanwhile. One of them took the successful sapper completely by surprise, gave him a deep, apparently fatal wound behind his shoulders, and left him. Another moved to cut off the herd's escape. The herd doubled back, apparently hoping for more assistance from the sappers. They got it: another tree fell, with equally beautiful timing, and this time the wolves were cut off from the herd.

Balch said he had hardly believed it; he felt it necessary now to indicate the details, with spoons, bottles, crumbs, and much waving of hands.

"This," said Chang, "is why you made that remark about chess."

"Correct." Balch explained to the others, "I kidded her before about the nibblies' not being intelligent for my money until they could beat me at chess. From this it looks as if they might be able to do it."

"And the wolves," Hilda suggested. "Their minds ought to run to strategy, too."

Her husband turned to her. "Let's not carry the joke too far. Any good chess player could have solved Chang's mazes better than that nibbly did. After all! Such a thing as carrying the joke too far."

"We're not joking, Frank," said Chang, "at least I'm not. Just think for a minute how the nibblies must look at things. You know, some primitive humans had to get over the idea

that all of nature was a lot of hostile intelligent spirits trying to outsmart them. Now for the nibblies this picture of the universe would be practically inescapable. They couldn't develop a naturalistic point of view. No wonder their technology's so low!"

Judy Jones, next to her, asked, "Why?"

Chang turned. "I'm sorry. I was thinking out loud. All this elaborate strategy Balch just described—that must be about the most important thing they use their language and intelligence for. Primitive man had no natural enemies to speak of, and none with anything like his intelligence; but the nibblies think against an opponent. That's got to have an effect on what kind of intelligence they have. So I was just making some guesses.

"Maybe not such good ones, because Frank's right: Brian, this nibbly I've had upstairs all this time, hasn't showed much wit."

"Don't believe her!" said Hilda. "He has, too!" Judy laughed.

Balch cleared his throat and said with a grin, "I'm not through yet, you know. Don't you want to know the final score? For the nibblies—three casualties. One I've told you about; the second was another of the sappers, caught the same way. The third was one of the nibblies who didn't make it past that tree before it came down; he got completely panicked, apparently, and struck off at random. They ran him down easily. So three casualties

for the nibblies. For the wolves—one casualty." He gave a smile of satisfaction at the surprised gasps this drew. "You think the nibblies have no weapon to fight back with? They do, and I've already mentioned it: they can fell trees."

"But the trees fall slowly," said Moreira. "The wolves could get out of the way."

"Here's how it worked. When the wolves saw they weren't going to be able to catch up with the main group of nibblies, they returned to the burrows in which a few had hidden, and began to dig. I imagine the underground nibblies got away; if not, they're added casualties. Anyhow, while this was going on, a nibbly popped out of a burrow, took a few gnaws at a tree trunk, and popped back—completely unobserved! The tree fell, after he was already out of sight, and mashed the hind quarters of a wolf who was stuck half in and half out of the burrow he was digging in."

Judy Jones broke the silence. "That trunk must have been cut almost to the point of falling before the wolves attacked."

Sumer agreed. "Not only that one. All the trees that were used must have been prepared, and probably others that weren't used were ready in case they needed them."

Judy looked around, and realized that by now the whole crew was in

the room and most of them had finished eating. She stood up.

Balch said, "What's the announcement, Judy?" loudly, to get people listening.

"It's good news." A broad grin flashed white in her pert black face. "I heard it just before the meal, and it's the best news since we got to Four." Everyone stirred in his seat, guessing what it must be and wondering that it had come so soon. "Melkote, Abiosu, and my husband vouch for it. One of the yeasts we brought is growing on a diet of plants from Four! It's thriving, and seems to have essentially the same chemical composition it would have back home. I'm sorry we couldn't serve you a slice or two today; we're not that confident of it. But even if it isn't a wholesome diet as of now—and Frank's group will have that checked soon—it's doing well enough that we're sure Four can support us. The food problem definitely can be solved!"

Her eyes swept the room, looking at everyone in turn. "Lots more to do yet," she said solemnly, "but we know we'll succeed now. This will be the fourth world where men have made themselves thoroughly at home. The first to be settled from Procyon II. And the most congenial to men. Well, maybe not the most congenial; maybe Earth is better. But I'll tell you this: Four is the most congenial to *me*."

"Let's take the afternoon off from work, now that the pressure's off a

little, and let's congratulate ourselves!"

There was a good deal of whooping and shouting. Balch hurried around the table to where Chang sat smiling silently to herself. He took her hand and led her out of the room. He was moving with an awkwardness and intenseness very strange for him.

Chang's mind registered this in full detail. It was true that she was occupied by her own thoughts, but they were about Tim Balch. She noticed how, as soon as they'd got to a deserted reach of corridor, Balch slowed, squeezed her hand, and struggled visibly to calm himself down. It did not surprise her that when he spoke it was in his usual light tone.

"Chang Kwei-T'ao," he said, "what do you think? Do you think you could bear my children?"

She said coldly, "*I thought* something like that was—"

He broke in, "I'm not trying to do the unexpected, Chang. I'm not trying to startle you. I just want you to marry me."

Chang bit her lip and tried to come out with a more considered reply. "Tim . . . after the colonists have begun arriving on Four, what will you do then?" She waited tensely.

"Huh? Why do you ask? I mean, that's a long time from now."

"I want to know."

"I'll tell you, then. As soon as it's possible I'm going to get myself in-

cluded on another exploring ship. And I'm going to keep on searching from star to star as long as I can."

Chang felt a long way away from him; it seemed odd that her voice was right here, and speaking so levelly. "By the time you can get back to the Procyon system you'll be a good deal older. And how do you know they'll have the resources back there to support more exploring?"

"I won't be too old—thirty-five, forty, forty-five. And I'm supposed to have good qualifications for exploring. And I have experience now. That other point I've worried about. Exploring parties have been few and far between in the past. But they'll come oftener and oftener now. Techniques of non-velocity travel are being improved all the time, and they'll be improved faster."

Chang interrupted him: "You just want to explore! You enjoy exploring, so you want to keep on. Is that all you want? Don't you have any more feeling for what we're doing than that?" She was speaking heatedly now. "We're not here to enjoy ourselves. We're here for the sake of Four, for the sake of *people*. People are going to come and live here! It's not just a game. There's . . . there's *content*."

She looked up at Balch. She did not understand the half-smile on his face.

Balch didn't answer until they had reached the end of the dim corridor and turned to walk slowly back. Then he said, "Sure, there's content to it,

Chang. But you don't have a long enough perspective." (Chang started, and hoped he hadn't noticed.) "People are going to come here to live, sure. After they come here, they're going to go other places. Planet after planet! The whole galaxy, the Magellanic Clouds, maybe farther! More and more people, a trillion, a trillion trillion; more lives, more science, more of everything human! And somebody's always going to go first.

"Maybe you've heard this idea before; well, I believe it. There will be some people who just explore. Specialists. The people who go first."

"And Tim Balch is one of them."

"Why not? As you say, I like it. I think I'm good at it."

"And that is more important than this one planet."

"More important. Yes. Are you disappointed in what I said, Chang? Why?"

"No, I'm not. Quite the reverse."

Chang was grateful to him for the silence that followed. They walked hand in hand, very slowly. Around the bend in the corridor ahead of them they could hear coming through the main air lock the shouts from the clearing. Some kind of ball game must be going on out there, the first one on Four.

Chang became aware of another sound, closer too. They were passing the closed door of Frank Streloff's lab; they could hear raised voices inside.

She nudged Balch.

They did not stop to listen, but the voices were audible. Frank was saying, "Yes indeed! On Procyon II, by all means. Where else?" There was a long sentence in a lower voice, ending with the shouted word, "Science!" which was repeated several times.

Hilda's voice came through distinctly, "Science to you means the inside of a lab! Myopia, Frank—myopia!"

Frank's answer was indistinct. Then Hilda's voice, even more distressed: "Why, of all the gutless—"

Chang was terrified, for some reason; she made Balch walk faster so they'd get out of earshot.

But it wasn't that simple. The door of the lab burst open behind them and Hilda came out, shouting back at Frank, "That's all! I'm fed up! Through! The end!" She went past them with long strides, her eyes set straight ahead, apparently not seeing them. She turned the corner of the corridor out of sight.

A moment later Frank came out too, muttering something. He looked at Chang and Balch, his face working, but he didn't speak to them, or even meet their eyes. In a moment he was gone, following Hilda.

All Chang could think of to say was, "I wonder where they're going."

"I know where Frank's going: to Chandra Melkote's lab. But he may not find Melkote there, and I know he won't find Hilda."

"Probably not."

They had reached the bend in the corridor; if they kept on they'd be in sight of the main air lock—people coming and going. Chang stopped, shaken, and looked up at Balch. He looked down at her, questioning. His face was very dark and calm, and his long arms were strong.

Chang felt tears coming to her eyes, which she thought was absurd.

"Tim, will you kiss me? You've never even kissed me."

He did, and then he lifted her up in the air, laughing, while she kissed him many times. "Your hair is so curly, Balch," she said gayly, "my cheek tingles when I touch it." Instantly she was afraid he'd be hurt by her lack of seriousness. "I'm sorry"—she pressed her forehead into his shoulder—"Tim, I do love you. Will you put me down now?"

They stood looking at each other; occasionally she leaned against his chest. Tim said lightly, "My people say the man's supposed to ask for the kiss; that's the tradition."

"Your people? Where are you from, anyway?"

"New Shreveport. Mostly Americans there. You're from Tsitsihar, aren't you?"

"Yes. My people have strange traditions too, if you go back far enough. I don't care."

"You know, we could be married at least for a few years. Then later, if you wanted to stay here and I wanted to

"Oh, no, no, that's *not* what I want." She was going to go on; but the full warmth of the kiss was just reaching her now, and she didn't want to think. "We'll decide soon. Not now."

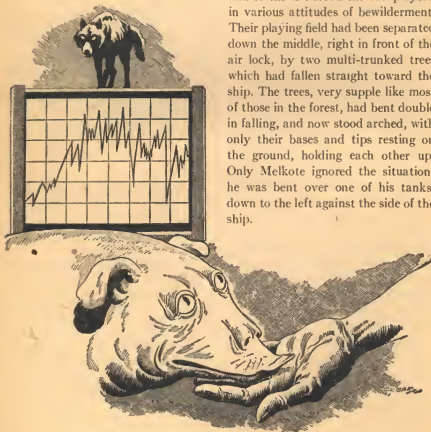
In a few moments she gave him a final, small kiss and led him in the direction of the air lock. "Soon," she said, "something will happen."

Something did.

V.

They heard from outside shouts of "Back! Get back!" then almost at once a loud crash. Simultaneously they broke into a run.

When they reached the air lock they looked down on a scene that at first made no sense at all. To the right and to the left stood the ball players, in various attitudes of bewilderment. Their playing field had been separated down the middle, right in front of the air lock, by two multi-trunked trees which had fallen straight toward the ship. The trees, very supple like most of those in the forest, had bent double in falling, and now stood arched, with only their bases and tips resting on the ground, holding each other up. Only Melkote ignored the situation; he was bent over one of his tanks, down to the left against the side of the ship.



Overhead the copter hovered.

Balch called, "Anyone hurt?"

Someone shouted, "No, nobody was in the way." Another voice: "Hey, it's Balch and Chang! Listen, you two, what do your friends think they're doing?"

Chang said, "Was it the nibblies?"

"What do *you* think?" answered Issy Jones, pointing to the forest edge where the trees had fallen from. A herd stood there, in conference.

"Must have been them."

"Well? Was it accidental, or were they aiming at us?"

Balch answered, "It wasn't accidental. Maybe they're fed up with us."

Chang quickly added, "Or maybe something else. If they'd been aiming at you, they probably wouldn't have missed."

A new voice broke in. The copter had descended till it was level with the air lock. Sumer was calling down to the people in the clearing: "Wolves in the neighborhood. I just now saw them; the forest's too thick to make much out; I don't know how many. But they're close."

Judy asked, "We'd better get back inside?" Balch and Sumer agreed, and she made it an order. The ball players had already started toward the ladder.

Chang noticed Balch checking that his pellet gun was in its holster. But she was giving her attention to the nibblies. They stood close together on the edge of the forest, in plain sight.

Four of them were working at trunks, and most of the rest were watching the ship. Did they know about the wolves?

Then she had to stand aside for the stream of people who were reaching the top of the ladder. Judy was there, saying, "Move on into the ship, leave Balch, Chang, and me here."

Balch whispered to Chang, "You know, I don't believe that about the nibblies' aiming for us, but a couple of the trees in that group would reach the air lock if they fell right. Judy, how're they coming?"

She looked over the edge. "Only a couple more. Come on, Bok, you're getting old. Hey, there's still Melkote!" She yelled down, "Hey, Melkote, didn't you hear what we said?"

The answer came: "My hearing is unimpaired; I'm repacking my samples, then I'm coming."

Balch suddenly gave Judy a sharp nudge. "Get everyone off the ladder. That tree's falling."

"Everyone's up but Melkote. Get back from the air lock, all of you!"

There was a confused retreat in the crowded corridor. Judy, Balch, and Chang stayed in the front rank; the rest tried to get a view over their shoulders.

There was silence while the tree fell hugely straight toward them.

Chang shielded her face with her arm. There was a crash—When she looked up, the top of the tree was lodged in the air lock. It quivered,

but did not fall out. She made her way around it to the opening and saw that the whole slender length of its trunk now stretched like a ramp from the air lock to the forest edge, supported in the middle by the smaller trees that had fallen a few minutes before!

Among the murmur of voices from the crew, one stood out: "Almost got us that time!"

Judy turned and said angrily, "What are you worrying about? If you think things are that serious, why stand around and gawk? Bunch of children! If this had happened yesterday, you'd have stayed in your labs and never—"

"It wouldn't have happened yesterday; the nibblies wouldn't have been able to get at us."

Chang heard Balch's quiet voice beside her: "I'm not so sure of that theory. There could be other reasons why it happened on just this day." Suddenly everyone was silent, listening to him. "First: Up until today they didn't know for sure that we had any nibblies aboard. Second: Today is the first time since this herd's been here that it's been in danger from wolves."

At this moment, as if at a signal, there came a shout from the copter, which had risen hastily when the tree fell but was now back down within speaking distance. "The wolves are closing in on the herd down there!"

Chang whispered to Judy, "Clear the corridor in back of us. And get those pellet guns."

"I see what you mean." She set about it. "All of you, back at least ten meters in the *side* corridors—"

Chang turned toward the outdoors again, straining to see what was happening at the other end of the slanting tree trunk at whose tip she stood. (Judy was saying, "And don't forget that any scratch needs medical attention. The chemistry of this world is a good deal like ours, but that's no guarantee—") Nothing could be distinguished out in the forest but a general confusion of fleeing and pursuing bodies. Then, there appeared confirmation of Chang's guess.

A nibbly came out into the sunlight of the clearing, walking up the slope of the fallen tree, straight toward them.

Another followed him. They walked slowly and gingerly on extended legs, and they were still a long way away, but they kept coming.

Balch swore, and asked Chang, "Is the whole herd going to try to get away from the wolves by hiding in the ship?"

"I don't know. You can see they're not used to climbing, though, so they must have something pretty special in mind."

A voice from below them: "What do you suggest I do?" Melkote.

Balch called down, "Do not come up the ladder."

From the copter, Sumer amended,

"Safer to go *halfway* up," and Balch concurred.

The first nibbly, having negotiated the hump in the tree trunk where it rested on its nibbly-made supports, was entering the second span. The other one was several meters behind him. No more had begun the trip.

But then one did—No. A wolf. "Look, Tim!"

"I see him. Shall I pick him off?"

Judy, from behind them: "Not yet!" Balch shifted his gun to his left hand and signaled to Sumer not to fire either. Judy went on, "No hurry. Think about it."

Chang said clearly and carefully, "The nibblies' whole life is escaping from the wolves. To them, we're either for them or against them. These two may even be trying this to make us show definitely which it is. Or maybe they have other reasons for wanting to be aboard. In any case, they probably guess we have ways of acting to protect them, and if we—Oh!"

"You talked too long," said Balch bitterly.

The wolf had almost caught up to the hindmost nibbly, who, starting to run, had lost his footing and fallen to the ground. He lay there in the middle of the clearing, obviously badly hurt. No wolf came out of the forest after him; they naturally would figure that that could wait.

"Looks as if it's too late now," Chang admitted. The other nibbly

was almost to the air lock, and in a moment more he arrived. He tripped clumsily off the tree onto the safer footing of the corridor, almost bowling Chang over; then took up a position just behind her, wiggling his pointed snout a little but giving no sign of excitement or curiosity. "We shouldn't take him farther inside the ship," Chang said to Judy. "Leave him here so he'll be getting the right air."

Balch shouted, "The wolf's still coming!"

Judy took a position five meters behind Balch and Chang. The pellet guns had been brought, and somebody tossed her one. Chang was watching, fascinated, as the monstrous animal came nearer, slowly and clumsily like the nibbly. Balch raised his gun. "Well?"

"No!" It was Hilda Streloff, in the side corridor. "The wolves may be intelligent, too. *You can't kill them.*"

Chang, taken aback, answered hurriedly, "If both species are intelligent, we have to get to know the nibblies first, because—"

"We can't kill the wolf. Let him approach."

Judy: "That may not be safe to us —*Hilda, get back.*"

Chang whirled. Hilda was dashing toward Balch from behind.

"*Don't fire, Tim,*" whispered Chang.

The rest happened very fast. Chang vaulted the nibbly and dived. Her shoulder hit Hilda's knee from the side and they both went down, Chang

underneath. Hilda was up again without a pause. Chang left her for Balch to handle; herself, she seized the pellet gun from Judy, who gave it up without question, and turned back toward the air lock.

Balch had realized Hilda was after his gun, and thrown it away, so as to confuse her; he'd then succeeded in twisting her arm behind her back, and was rapidly hustling her back toward Judy.

Chang stepped forward, facing the wolf, who was within three meters, tensed to jump into the ship. She had time for one shot, and she aimed over his head!

The wolf, startled by the sound, tried to draw back. He teetered there; Chang fired again, splintering the wood at his feet, and he lost his balance and fell.

Chang wanted to see if he was killed; she leaned out over the edge a little way, clutching the tree for support in her giddiness. She saw Melkote leaning far out on the left side of the ladder as the wolf, limbs thrashing, fell past on the right. This made her laugh. Melkote turned his face up to her: "What kind of behavior is this, Chang Kwei-T'ao?"

Then Balch's arms were around her, pulling her back into the ship.

VI.

Chang rested there for a moment with her eyes closed. She said, weakly,

"I'm sorry, Tim. Maybe I shouldn't have told you not to fire. But Hilda was right this far: We had to try to stop the wolf without killing him. Well, we didn't. Maybe at least it'll help our relations with the nibblies."

It was Judy's voice which answered. "Rest a minute more, Chang. Are you hurt?"

"I'm all right. Did Tim leave Hilda in one piece?"

Tim laughed softly. "I did that; but *you*, little one, should be more careful of your fellow crew members. She bruised her hip properly when she hit the deck."

Chang smiled and opened her eyes. Tim was sitting beside her. Right in front of her stood Hilda, explaining in a low voice to Melkote what had happened—rather shamefacedly when she came to her own part in it. Most of the other crew members were there, discussing disconnectedly. The most unconcerned of all was the one who had been in the greatest danger: the nibbly.

She pointed to him. "Tim Balch, look at him. What's his name?"

"Let's call him Max."

She chuckled. "Max the moron; moronic Max. Nothing matters to him."

"Say, you know . . . as a matter of fact—" His tone was odd; she turned to face him. "I have just understood something. Max is a moron. So is Brian, upstairs."

"That's what you said several days

ago. Listen, you're not joking, are you? What are you trying to say?"

Balch rose to his feet, smiling in wonder. "Brian is a moron. He can't think. Even in solving your little mazes, which is just the type of problem a nibbly should be best at. Max is a moron. But the nibblies together were able to build a bridge across the clearing to the ship in practically no time. How can that be?"

"There are a few nibbly masterminds who plan everything, I suppose. Bad guess. If that was true, it would have been one of the masterminds who came aboard just now, instead of moronic Max here."

That stopped him. She explained, "Why all the effort to get Max aboard? Not *only* to find out if we're on their side and able to help them; they could have tested that more simply. They knew we had nibblies aboard and they hoped we'd let Max see the captives, for purposes of communication."

Balch gave a broad grin. "Good. Very plausible. Particularly when you've heard my idea. No, there are no nibbly masterminds. Just the reverse: all the nibblies are morons."

"Spare me your riddle, O Sphinx," said Chang, a little irritated, then stopped. "I begin, to see, your point."

"I always make sense in the end! The difficulty we've had is that *we've assumed the nibblies can think separately*. They can't; not well, anyhow. All their planning is done in groups of

eight or more, with noses touching. We've never seen one of them do anything even slightly clever, except in a situation that could have been foreseen and provided for by a conference."

Now Chang was on her feet, too. "Thank you, Balch, thank you!" she cried—then realized that a small throng was listening to their conversation; among others, Hilda and Judy. She said to them, "Did you hear what he said?"

"Heard it," grunted Hilda. "If you're discouraged about the intelligence Brian's shown, I guess this theory is a good way to revive your hopes. But why is it necessary?"

"It's true," Chang insisted.

Hilda said morosely, "I realize I'm not thinking too clearly today, but it seems peculiar to me. I never heard of such a thing."

"I know, I know, a padzid is as intelligent by himself as in a crowd; *but* that's not analogous, because the padzid's thought has very little to do with communication. Also I grant you a human's pretty resourceful when he's alone; *but* suppose he had to think without words. Then how would he do?"

"Not nearly as well. So?"

"A nibbly alone has no language to think with—at least, I'll guess he hasn't much. Compare him with a human, for instance me. The operations I'm going through in talking to you, I could go through if there was

nobody listening at all. The nibbly can't, we know that. Without an audience, he can't talk, and even when he's got an audience his remarks are always blended in with their responses. Isolate him, and what can you expect but what we found: no organization, no creativity. Balch, how am I doing? Am I doing your theory justice?"

"This argument you just gave I hadn't thought of. Better keep talking!"

"All right. There's another thing. This . . . this completely co-operative intelligence fits with the way the nibblies live, too. In herds, like most plant-eating animals their size. The groups which developed the language were larger than the groups which developed human speech. The earliest speaking Earth humans already liked company, sure, but they didn't mind living in small groups like the family."

Balch took over at this point. "And look at the purposes the nibblies use their language for. The first one, tree-felling, doesn't prove anything, because that would be physically possible for individual nibblies to do alone—although, we notice, they don't. But the second purpose is escaping from wolves. They can't do that on the basis of each-for-himself. They have to have their signals straight, and follow them."

It was Chang's turn to interrupt. "That's true, that's true! Humans

have learned to think socially, a little, but it's only reasonable that an animal which just naturally thinks that way should be different. No wonder we've had trouble understanding the nibblies! I'm afraid of something. I'm afraid I've talked too long again."

Balch started. "That's right—we should be protecting that wounded nibbly out there." He jumped to the air lock opening, peered around the treetop that still blocked it. "*Whew!* Good for Ranji. He's landed the copter and is standing there."

"Well, that's a relief. Maybe the nibblies will still trust us." She addressed Judy and the rest, trying to control her excitement enough to be coherent. "Listen, I can't wait to test this. We should try it right away. I've been trying to talk with Brian; we should try to talk with a whole herd. We can do it in the clearing—two of us, we have two of those 'communicators.' We'll need five people or more to help out with mechanical details and guard us from wolves. And we'll have to take—"

"Hold on," said Judy, smiling in sympathy with Chang's elation. "There are other things to be done, too. Most urgent, we should have a discussion of what happened when the wolf was approaching the air lock. What a disorganized bunch we were! It's lucky this is a nice hospitable world. If we were ever in real danger, it'd just be chaos." Catching the twinkle in Balch's eye, she finished,

"We should put our noses together real soon and conduct a little good sense."

But Chang's impatience prevailed. Twenty minutes later the stage was set.

A gamble had been made: Brian, the one nibbly with whom they'd had any contact worth noticing, had been turned loose. Max and Felicia had been turned loose at the same time, Rose being kept behind at Judy's suggestion so that if Chang and Balch were wrong there'd still be one captive.

When the three had been freed, they'd gone into the expected huddle. Chang's assumption was that Brian had indicated to the others the possibility that humans were articulate animals; and that both he and Max had had a good deal to say about humans' trustworthiness. But she couldn't know, yet. Perhaps the three had made too small a group for rationality. They'd left together, with Sumer following overhead in the copter to watch for wolves as well as he could.

And now Chang sat in the clearing, waiting. On the tables beside her, among other necessary articles, were the two communicators. They had been hastily modified to record any current that flowed through them. Another recorder was hooked up to a microphone on each table; if possible, the human members of the conferences would interpret as they went

along. If possible! And if the conferences took place!

Chang did not look at the nibblies' bridge to the air lock, which still stood, or at the two animals that had fallen from it, who were both dead but had not yet been taken aboard for dissection. She sat and stared at the forest—the wavering vertical tree trunks catching the sun like waterfalls, surrounded by blue-green mist. No nibblies so far; only the armed crew members patrolling the clearing.

Hearing a step behind her, she turned. "Hello, Balch. You got the movies from the trip taken around?"

"Yeah." He stretched. "Schematics to do yet, but you come first." He gave her a small, public kiss, and sat down on the ground next to her.

Her hand stroked his shoulder shyly. "I want to talk to you, I really do, but I can't think about anything but this just now."

"I know what you mean."

"I'm very glad you made it down here when you did. Sumer has radioed that our envoys have made contact with a herd, so if anything's going to happen here it'll be soon."

"You'll have plenty of helpers with or without me. There's still enough of a holiday atmosphere around the ship that your meeting will attract a crowd of spectators sure."

"Oh, there'll be people to help." She gazed meditatively at the forest. "I want you specially, though: to handle the second communicator."

"Huh? How about Hilda?"

"Well, she knows the instrument better than you, but Judy's having a real serious talk with Hilda at the moment."

"Oh, of course."

"It's just as well for you to do it. You think more like a nibbly."

He laughed gently in a way that made her very conscious of his closeness. "Do I? A few days ago I wouldn't have said either of us quite had the nibbly touch."

"I know; difficulty with co-operation. I don't feel that way any more."

"Why? Because I had a bright idea?"

"That's not the reason; you've had bright ideas before. And your second guess will be wrong too, so don't make it." She laughed and leaned closer to him. "It's just that I understand you better now. Furthermore, I am not being cryptic, and furthermore I love you."

They stayed there quietly in the blue sunlight, Chang giving snatches of last-minute advice to Balch as she thought of them, until the copter appeared overhead and a procession of twenty-odd nibblies filed out of the shade of the forest.

Then everything was activity. Chang and Balch switched on their equipment and ran a final check: an AC signal from Chang's signal generators showed up on her two oscilloscopes in identical smooth waves;

then cutting in the side circuits in turn produced various modifications of the curves on the screens. The nibblies split into two groups, both of which huddled, while messengers ran back and forth between the two periodically. The sentries pulled in closer. Sumer landed his copter, and he and Melkote came over to offer their services; they were put to work taking movies of the proceedings. As Chang had predicted, several of the crew who had been aboard the ship came out to watch; two of them were asked to stand by to help with any adjustments on the communicator circuits.

One group of nibblies came straight to Chang's table and gathered round the contact she'd put there for them; the other group did the same at Balch's table. So they'd understood that much. Chang felt that her worries were half over already.

But the harder half remained.

The preliminaries were merely irritating: the output from her signal generator to be reduced, the high peak voltages to be cut off, and other such pesky adjustments. Then when the nibblies finally seemed satisfied that she was speaking in a normal conversational tone, she settled down to see what would happen. Her vocabulary gained from interviews with Brian was of course much more extensive than she'd been able to tell Balch, even though most of it was vague; she expected to begin catching the nib-



blies' remarks right away.

She didn't. A mere jumble appeared on her main oscilloscope. Nothing simple and clear.

Don't be impatient, she told herself, you're hearing all their advice to each other inseparably mixed with what they decide to try to tell us.

But guessing the reason didn't make it easier to wait. She decided it'd be necessary to give the nibblies something specific to refer to. She said—and the mike in front of her recorded it—"Keller, jump up and down a few times." He did. "No response. Keller, this time come over and touch me on the arm first, so they'll know your actions have something to do with me. Then jump around a bit again. Good."

A pip had appeared on the main

scope, much like the one Brian had used to refer to her. She twisted knobs, making her output, as recorded on the auxiliary scope, match that pip. The incoming signal changed, first to a form she recognized as registering satisfaction, then in a sudden shift to an unknown pattern. She smoothed out her own signal, making it almost featureless, and reduced the gain, hoping this would indicate her confusion.

"Keller, touch me again, then go around to their side of the table. Don't frighten them—better stop there a minute." She had caught sight of a ripple on the rapidly changing curve before her which she thought indicated Keller should stop. The rest was puzzling. She twisted knobs again, trying

to indicate in the changed context two notions she thought she'd been able to convey before: "human," questioning.

One of the nibblies left the circle, approached Keller. "Stay still, let him come closer." The nibbly pressed his nose against Keller's outstretched hand. Could he be expecting direct communication? *No*, because the pattern Chang saw on the screen just then was completely clear. She responded quickly and confidently, and followed the succeeding shifts of pattern with less bafflement than before. It had been an expression of friendship!

Now the nibbly left Keller and loped, almost casually, toward the forest. Those who remained with Chang reduced their signal to a mere flutter; she belatedly followed suit. Apparently she was expected to wait for something.

She used the time to say into the mike, "If this system ever gets worked out, the side circuits will have to be operated by a keyboard or something. These knobs are no good; I can only turn two at a time."

Melkote, behind her, was beginning a reply when the nibbly at the forest's edge suddenly broke into a frantic run toward them. Simultaneously the scope on the table went mad: the amplitude shot up, and the wave had a stark, jagged crest completely unlike anything Chang remembered.

"Wolves around, maybe," she muttered. "Tell the sentries to look sharp.

Keller, stay where you are." The lone nibbly streaked toward the group at Chang's table, made as if to join it—but actually did not—then left and ran to Keller, laying his nose in Keller's hand once more.

It couldn't have been wolves, Chang was deciding, or the nibbly would actually have joined the circle, to tell them. Then, by developing stages, the scope explained. Her hands accompanied the changes, flying over the row of ten knobs; but even in the process she relaxed and smiled. "It was a pantomime indicating their danger, then their trust that we'll help defend them. I wonder what they've got up their sleeves next—Hey, guys, you know what's happening? *They're teaching me.*"

Melkote seemed excited for the first time since Chang had known him, but he said only, "Entirely appropriate, since it's their language."

"But how do they know how? Oh, yes! They must have to teach their young. Keller—how can we check that? Melkote, try this: touch me on the arm; now go over to that nibbly by Keller; put your hands at both ends of him, measuring his length; now step back and bring your hands closer together to indicate a small nibbly. I wonder." There was a response, a new wave form appeared. Chang was sure she'd been right.

The nibbly on whom Melkote had demonstrated hastily rejoined the

huddle. Of course—the human pupils had done something unexpected, so he couldn't decide by himself what to do next.

In a moment he left again, to stand before Melkote. "Maybe you should repeat those gestures, Melkote." He did. The nibbly turned his sharp snout toward the ground and began digging with his forefeet. More novelty on the scope.

"Ha ha," said Chang, "apparently nibblies are born underground."

She sat at her instrument a moment, her eyes and her fingers dancing, before the other implication of the demonstration struck her: "You realize what that means? They have the perspective to realize that *our* maternity wards may *not* be underground."

This was the clincher for her. Not only were the nibblies, these uncivilized, blank-faced, four-legged grazers, conducting the lesson; she was even convinced that they could do a good job of it. Were already doing a good job! From that point on she let them direct. She had to take the lead now and then, of course, and she was constantly busy at her controls, responding to every signal, agreeing, commenting. But the nibblies set the schedule and chose the subject-matter.

It was different from a human's teaching. No repetition of independent words, for the words were not independent; everything was always in

context and the context was always different.

She learned without being conscious of how she learned—the way a human child learns, only faster.

She even went so far as to accept the language completely on its own terms. That is, she stopped looking at the auxiliary oscilloscope which gave her signal separate from the incoming one. She did as the nibblies did: sensed only the net current flowing through her circuit. It worked.

The rest of the afternoon became more and more like telepathy.

When Chang learned, for example, about the rudimentary sign language the nibblies had for signaling over distances in open country, she didn't just learn the fact. The fact came through clearly and translatably, and she reported it to the microphone. The rest she couldn't translate; the nibblies' language was too different in principle from the symbologies she knew. But it came through. She knew—or thought she knew—some of the features of the sign language. She knew—or thought she knew—the satisfaction the two signaling nibblies would have at joining their minds over such a distance, a warm affectionate happiness. She felt such sympathy, she tried to tell the nibblies that humans could give them a better way of communicating over distances. This may have failed; the response was confusing; she decided she'd just have to *show* them Hilda's idea of metal

wire. Later. For now—she was sure they had understood her sympathy.

Occasionally she glanced over to Balch's table. She noticed several times that the crew members standing by were demonstrating something or other to the nibblies there, at Balch's direction. Should she send Keller to Balch with advice? It would occur to her, but she was always too busy. She sat absorbed, forgetting after a while even to use the microphone.

The shadow of the ship had reached them before her group of nibblies finally broke up. Balch's did the same a moment later.

Chang rose from her seat, blinking, and smiled at the crew members who still stood there, unable to tell them what had happened while they'd watched. Then Balch came over, swinging his arms vigorously to get his circulation back.

"Chang, these animals are—" He grinned, laughed out loud in his enthusiasm. "They're subtle, Chang. Very subtle fellows!"

That hadn't been her principal impression at all. "They're so understanding, Balch! They're able to—"

"Oh, they understand, all right! I've run through the science of addition, among many other things."

"And decimal notation?" asked Melkote.

"No, I haven't even given them symbols for numbers; I let them work out their own. But it's fantastic, that

they should catch on so quickly. I'm sure they didn't have any arithmetic of their own."

"I don't think so either," commented Chang. "Why should they want one?"

Balch laughed again. "That's the thing. Can you imagine a human society at their level of culture seeing the sense of arithmetic? Why should they want it? Let alone picking up the basic ideas in under an hour. These nibblies are subtle!"

Chang was disappointed: she wanted so much to share with Balch her own experience with the nibblies. She said, inadequately, "Tim, did you try letting them teach you?"

"No, I got along all right telling them. After all, we have more to tell than they do."

She frowned a little and changed the subject. "Do you think they left because they're hungry?"

He followed her in watching them. They were in two huddles, twenty meters or so off from the tables; and, as before, messengers made frequent trips between the two. "If they were that hungry, they'd just take off into the woods and eat. No, they're probably digesting the information they've picked up."

"And planning what to discuss with us next," Chang added. "You know, there must be a practical limit to how many of them can touch snouts at once; I'm sure they'd all get into one big conference now if they could."

"Sure. Shall we break out a short length of copper wire so they can?"

"I thought we'd wait on that. They've got enough new to think about."

"All right. Listen, Chang, we shouldn't relax now. We should record what we've done while it's still fresh in our minds."

She was disappointed again, but she agreed: "I guess so." They went back to their tables and spoke into their mikes for a good quarter hour.

Shadow slowly flooded the clearing and washed upward, submerging the blue-gold of the forest wall. Even though there was a full hour left before sunset, the objects around Chang were lighted nondirectionally, dusk-like.

Then the nibblies returned to them.

Chang switched her communicator on again, prepared herself for another lesson—and got the biggest surprise of all.

The nibblies, she realized immediately, were teaching her to add.

There was no doubt about it, because one of them stood apart from the rest and demonstrated visually. He used tally marks scratched on the bare ground for his numbers, and the "plus" and "equal" signs just learned from Balch. The signals on the scope, of course, were not familiar to Chang, but she found she could pick them up almost as fast as the nibblies could produce them—and indicate to them

that she was doing so. From arithmetic they went on to other subjects. Whole avenues of communication, which Balch had opened up with difficulty, were opened to her in minutes, almost without effort.

And she slowly became aware of something else. Something in the nibblies'—attitude. It bothered her at first. She was sure it wasn't unfriendly; she was sure that having participated in conferences with them she was their friend, completely. But something about the signals was odd.

Suddenly there appeared on the screen a new, subject-changing pattern: the symbols "human" and "nibbly," oddly juxtaposed. Chang got the point then; but when she looked down at the expressionless round backs and pointed snouts in front of her she could hardly believe it.

It was this: What had gone on in the previous session at the two tables had been so different that the two humans involved could never have told each other what they'd learned. As it happened, they'd hardly begun. Realizing this from the humans' responses, the nibblies had told them! *And the nibblies thought it was funny.*

She had barely absorbed this when her nibblies broke the circle, leaped away, and paraded before her in a neat figure-8, in their awkward up-and-down loping gait, but so fast it was more like a caper.

Balch's voice: "What in fury are they doing?" His group, too, had

joined the comical dance.

"That's the way they laugh!" she exclaimed. "The joke's on us, Tim!"

The bewilderment left his face; and then he and Chang had to laugh, too. They sat back in their chairs and laughed till they wept, releasing all the tension of the afternoon's effort.

Chang was brought back to herself by a sentry's shout: "The nibblies are heading into the forest. Hey, Chang!"

"What? Oh. Don't try to follow them. They'll have to split up and go several different ways, to pass the word. They'll be back. And Sumer—you can stop taking movies now."

Because she couldn't stand it any longer. She ran and threw herself into Balch's arms. "Tim, Tim!" No waiting until they were alone, no sleeping on it before she spoke to him. She had to be close to him, physically close, *this* close, right now.

"Tim, we've talked to them!"

"That's an understatement of what we've done, little Chang." He chuckled. "I would say they've passed our

intelligence test, even without playing us chess, wouldn't you? I hope we've passed theirs. Imagine what they'll be able to do when they have some of our technology."

"I can't. I know one thing, though: it'll be different from what humans have done. We'll have a lot to learn from the nibblies. There's one thing I don't want to pick up from them, though." She pulled his head down and whispered so no one else could hear. "I want to be married human-style, monogamously, to *you*."

He pressed his cheek against hers. "You've figured that out, have you? That we can get married now?"

"Yes, and you have, too. Tim, people *will* go to new stars, and new galaxies, and you'll help them go. But you won't be on exploring ships, you'll be here, we'll be here, on Four. That's the important work, that's what we both have to do.

"Because when the first ship leaves for the Magellanic Clouds, there won't be only humans aboard. *The nibblies will go, too.*"

THE END



COMMENCEMENT NIGHT

BY RICHARD ASHBY

The idea of the project was wonderful: What would children who had no cultural background, no educational bias, develop for themselves? Interference was unexpected. . . .

Illustrated by Miller

As he entered the View Room the lagoon screen showed a coffee-colored girl with blond hair to her hips emerging from the sparkling blue water. In one hand she carried the shaft of an iron-hard pemphis wood spear, in the other was her hair stick.

"Hi," said Ted.

The tech he was relieving started, jerked his attention from the screen. "Oh, Jepson. You scared me. Hello."

"What gives with Nea, there?"

Ted nodded at the girl on the tele-screen, the girl fifty feet above them and a half mile down the island who tossed the broken spear onto the white sand.

"Nea, huh?" The tech gave a resigned sigh. "They still all look alike to me."

Ted went to the control console. "Wait till you've been here a few years, Mike. You'll know their scars, the number of cavities in each set of choppers." His fingers found the

zoomar pot, began to twist up the magnification. "Nea, thirteen years old, daughter of Le and Beto. Oriental and Negroid ancestry, predominately."

Nea's face and shoulders filled the screen. Her strong dripping wet features showed plainly her racial heritage; large, though not unattractive upper lip, arched nostrils, and the incongruous charm of slanted eyes. "And that blond hair?" asked Mike as the girl began to wring water from her long tresses.

"Her paternal grandma's contribution. She mated with one of the Chinese. Her coloring skipped her own kids to show up in Nea."

Mike grunted and began to collect his belongings—jacket, pen, thermos. "There's nothing much new, I guess. Most of the young ones are out on the reef. There's a big octopus washed in. He's too tired to get back out to sea, evidently. Cut up, maybe, but he's got plenty of poop left. I guess Nea

broke her spear on him." He scribbled his name on the duty log, wrote 6:04 as his off time. "The mike at point thirteen's gone dead. I noted it down, called maintenance. There's a little ghosting on pickups eight and two. Not really bad enough to mention. Aside from that, nothing new. See you."

"Night."

For the next few minutes Ted Jepson was busy loading the sight-sound recorders with fresh blanks, checking the turntables, the cutting styli, all the while keeping an eye on the twenty television screens that made a mosaic of the huge wall across the room from the control board. Then he dialed Weather. "Fair and warmer, not much change in temperature. A nice night for romance," said the boy at the other end.

Radar Sweep had little to report. They'd gotten a flicker of metal from something fifteen miles northwest, but the Garbage Men had already taken a sub out after it. Yes, they'd have Garbage call him when they heard anything.

The girl at Transient Desk told him in her soft Texas drawl that there was a vip from U.N. just in. "But he's bein' entuhtained by Public Relations, so he probably won't be sobah too long."

Jepson hoped she was right. If there was anything he detested, it was having politicoes snooping around

during his shift. The journalists and visiting scientists were often bad enough, but the U.N. reps with their cold eyes peeled for "useless expenditure," their frequent inability, even, to grasp the great significance of the project really teed him off.

Sinking into the swivel chair, he turned up the sound level of the lagoon mike and let his worry wash in the sigh and tumble of ocean noises from above. Nea had finished plaiting her hair, and after winding it into a clever bun, secured it with a thrust of her hair stick. Then picking up her broken spear, she trotted up the beach and along the path that led into a dense arbor of Tournefortia trees. As her image faded from the screen, the one next to it picked her up and followed her through the Tacca fields till she dwindled out of sight among the bamboos behind the huts. Another screen caught her as she emerged, and Ted watched her enter the palm-thatched weapons lean-to.

Tapping on the mike that was concealed in a nearby outcropping of "stones"—reinforced concrete, actually—he listened as she complained to the custodian of spears, a boy of her own age with a crippled right leg. The youngster answered that while she was quite within her rights to be vexed about the spear's breaking, it was possible that she should not have used a weapon designed for fish on an octopus. A large octopus, added the girl in agreement. They joked about



the animal's now having a spear tip to fight back with, and Nea selected another weapon.

The entire conversation had lasted almost three seconds, not counting the laughter.

Routine stuff.

Ted looked idly at the other screens; the pleasant activity of the quiet village, lovers lost to themselves in the bamboo groves and in the caves at the base of the island's highest hill, people gathering trapped lobster from the tidal pools, and children playing some mad racing game amongst the litter of coconut husks beneath the palms.

A routine afternoon in heaven, he mused. Eight square miles of heaven for three hundred and twenty-five people, not one of whom could possibly appreciate it.

"Heaven" was thirty-six years old, and had cost millions and millions of dollars, and thus far had presented the world of science with less enlightenment than with headaches and mystery.

As a philologist, Ted Jepson was quite certain the biggest enigma was the strange and splendid language the islanders had already evolved. A flexible, immensely swift communication in which, for example, a noun concept could take on a verb tinge by a slight tilting of the inflection; in which "limited" absolutes and negatives existed. A language of predominately external syntax, with almost no basic

structural priority, yet one capable of astonishing refinements and references.

He had many times given up attempting to describe it to such lay observers as journalists or philosophers, for to speak of it one was almost forced to converse in it. Eleven universities on five continents had already acknowledged this, and—somewhat sheepishly, for it was, after all, a "primitive" language—had established special Chairs to teach it.

But specialists in other fields insisted theirs were the puzzles: Psychologists, for example, chose up sides and fought pitched battles in learned journals attempting to reconcile the islander's tough-minded realism with their extreme altruism. Philosophers grew petulant over the islander's zero amount of speculation over their own origin. And musicologists took to drink when faced with what they resignedly termed the "sophistication" of their quarter-toned love songs and lullabies.

Sometimes Ted Jepson wondered if Science's bewilderment might not, after all, be an absurdly naive thing. Were they all, himself included, missing the obvious point? Perhaps the islanders simply illustrated a normal development for any group so freed from the weight of a parent culture with its outmoded jumble of mores, language, and legends.

That was, after all, the purpose of the experiment.

In 1958 the Swiss delegate to the

United Nations, in a caustic and rather flip vein, had stung the General Assembly with his observation that "... Whereas that gaggle of blunderers, the League of Nations, impudently set out to cure man of the disease called War, we of the U.N. have evidently deemed it nicer to turn our backs on the disease and treat its symptoms."

The Western bloc was instantly on its feet, howling for the remark to be retracted. And for the first time in two years, Russia decided to sustain a Western resolution. It was several minutes, in the swirl of high-strung confusion, before the Chair managed to recognize the minister from Australia.

"The criticism, while not without its point, is hardly constructive. What," inquired that man, "does the spokesman for the Alps propose we do?"

It was the sixty-four buck question, and the answer staggered the world.

Take an uninhabited island, suggested the man from Switzerland. Rid it of its rats and flies and disease germs, and plant it with simple foods. Beneath that island construct quarters for a team of scientists, and equip them with means to see and hear everything that goes on above them. Next, stock the island with forty or fifty infants, retire, and ponder the results. Carefully. For only by determining the nature of the patient, man, could a diagnosis be properly prognosticated

and the particular therapies developed.

Any questions?

While jaws were dropping still further, and eyebrows managing to climb higher, the Swiss admitted he was speaking as chairman of a group which included Mexico, the Philippines, Sweden, India, Thailand, New Zealand, and Ireland. The engineering details of the proposal had already been worked out, and a certain island in the Marshall group had tentatively been chosen for U.N. consideration.

Five hours later, while the storms of controversy were beginning to build in every world capital, a New York public relations firm began planting their releases. At first they were of the "Well, after all, why not?" tone. A week later they hit the second phase of their campaign, and few people in the civilized world remained in ignorance of such things as how the infants were to be fed until they could forage for themselves. (From the walls of a sterile irradiated cave, maneuverable rubber teats would seek out the tiny mouths. And when they could crawl, they would find food had "dropped" from the bushes and trees that were to overhang a low-walled pen just outside the cave.)

What foods?

Well, milk formulaes at first, of course. Then coconuts with their cool sweet fluid, their juicy flesh. The starchy tubers of the Tacca plant—sometimes called Polynesian Arrow-

root; very nourishing, tasty, simple to grow. The crunchy golden keys of the native "screwpine." Purslane, an excellent green whether cooked or raw. Clams, lobster, fish of all kinds. A panel of gourmets and dieticians found it profitable to assemble before a C.B.S. camera and discuss the delicacies that would be available.

The emphasis was always on *when* the project gets under way, not *if*, and world opinion began to swing into line.

But where would the infants come from?

They were ready for that one, too. On May 10, 1959, the M.C. of Mutual's big "Retire For Life" show announced he had an important surprise. "Whoopercolossal," he phrased it. And near the end of the program, the stage revolved to bring into view thirty couples who stood smiling into the sets of eighty million viewers. They had gathered here from all over the world, America was told, to volunteer their services to the project.

Parents-to-be.

The opposition threw in the sponge.

Contracts were let for the island engineering. Medical teams set about choosing the parents from the volunteering hordes. Psychologists and pediatricians and cement authorities conclave with electronics men. Russian and American U.N. officials cross-questioned agronomists and radar technicians instead of each other.

And "Heaven" was ready for occupancy in little over two years.

Its designation on standard marine charts had always been "Muritok" in the Marshalls, but this seemed hardly satisfactory. An international contest was held, and a Turkish housewife became rich for having been the first to suggest "Arcadia." The name didn't stick, however, for the world had been calling it "The Island" from the beginning, and was quite happy to go on calling it that.

It was quite a production. Radar patrols kept the sea surrounding the island empty of all craft, save for commuting subs. Grapples could be hoisted from other subs to snatch down any foreign objects floating toward the island. The project's technical complement of fifty men and women, more or less, was housed in spacious, well-lighted, well-ventilated quarters beneath the surface. Television eyes scanned the island from every conceivable hiding place—from within boulders, behind coral walls above and below the water, from "palm stumps" and cliff walls. Except for a few unimportant blind spots, there was no hiding place topside. Nothing dare be sacred. Nothing was.

Forty-five babies were born in a Tokyo hospital within four days of each other, a feat of timing which elicited no small amount of comment, and were flown to the island when the youngest was ten days old.

Twenty boys, twenty-five girls, their parents representative of the finest breeding stock to be found in

every major nation.

And the world adopted them from the start.

The weekly TV show transmitted from the island, "Project Peace," maintained the highest audience rating ever tabulated. Cautiously edited at first, in deference to the prodigious multiplicity of international taboos, the films showed merely the fat, healthy youngsters cooing and laughing and playing happily in the bright Pacific sunlight. Careful shots, with shadows and branches amending the nakedness, to begin with, but by the time the toddlers were beginning their wide-eyed exploration of the island, people had, for the most, grown quite accustomed to their undress. Mistakes were made, of course; the hilarious, and now famous episode, in which two eight-year-olds—a Caucasian boy and his little Japanese girl companion—discovered the effects of fermented coconut sap, was poorly received in some quarters.

But on the whole, Earth widened its moral outlook considerably to make room for its beloved castaways.

And the castaways, as if responding to this generous adoration, thrived and multiplied.

The intercom buzzed and Ted flicked it on. "Jepson," he said.

"Margate," came the nasal reply, "in Transmission. Look, Ted, we're mighty short on next week's show, and I hate to pad it out with any more

library stuff. How about getting me a platter of something good?"

"Such as?"

"Oh, you know. Something interesting. New. Some shots of them inventing horses, or biting out doilies with their teeth. You know."

"Yeah. New."

"If you like, I'll go topside and stir them up a little. There's a certain red-head with long brown legs—"

"I'll get you something," Ted interrupted. He clicked off. Did Margate, he wondered sourly, *have* to be so typical? Every new man seemed to go through the same pattern. First, a detached, veddy professional attitude toward the droves of nubile beauties who wandered around topside. Next, with their probationary periods successfully over, they frequently found it necessary to visit the View Room—some of the excuses Jepson had listened to had been dillies. And finally, after becoming more or less blasé about what was so near, yet so far, they began to be obsessed with the temptation to "go topside and stir them up a little," as Margate had put it.

That last stage was what nearly got 'em, Ted knew. Even the gray-beards on the project, who certainly realized the experiment was predicated entirely on strict nonintervention, occasionally voiced wistful, half-serious desires to have the islanders find a phonograph and an album of blues records, a flashlight, or an illus-

trated encyclopedia—anything that would jar them into an interesting reaction.

And there were those others who wanted to go topside once just for the hell of it. Himself, for example. He supposed that's why he'd done it.

Ted decided to get Margate some shots of the octopus kill. Ought to go over well, he figured: Good-looking youngsters; the azure, crystal-clear depths of the lagoon; sun setting into a glory of cerise and golden clouds; and the poor squid providing the element of "danger." He flicked on two screens from a supplemental bank on the right wall, turned up the corresponding mikes. The room came alive with excited sounds and brilliant color.

After starting a recorder going and setting up the proper circuits, he backed away from the lively scene with a twist of the zoomar pot and lowered the twin cutting needles down onto the glossy face of the slowly turning blank. Then, with ample time allowed for commentary, he panned in to the splashing mob of kids and settled down to alternate takes, first a high angle shot from the eye concealed in a jutting needle of "coral," then with an almost water-level view from full front. The octopus wasn't visible, but there was plenty of inky discharge in the four feet of water to mark its presence.

With the low-level eye, Ted began getting some fine close-ups of faces as the kids ganged up to rush their

quarry. From a lass of twelve or so, with Ireland written all over her freckled features, he got fifteen seconds of that ecstatic blend of joy and fear known only to children. From a tall, magnificently-built Negro boy, a fierce scowl of determination. And in contrast, the face of a quiet girl, whose unbound hair floated like a soft ebon cloud about her shoulders. Ted panned in as she pursed her lips thoughtfully and closed her eyes, a line of concentration furrowing her brow.

The brunette's private reverie wasn't carrying the episode forward, he realized, and with his finger poised above the alternate "take" button, he examined other faces in the group.

They were set in similar expressions.

A chill of astonishment swept him as he gazed at the youngsters. Like dripping statues, like sleepers in a dream, they held their attitudes of rapt, blind attention while ten long seconds came and went.

Fifteen seconds. Then a small blond boy opened his eyes and shuddered as if to free himself from an unpleasant vision. The spear slipped from his fingers as he turned his face slowly up to the darkening sky. "Sarreeoah ay," he stated, as if to himself. Then louder he said the phrase, again and again.

Ted puzzled it out to mean roughly ". . . At this spot, we nine, from this spot away in no more time than it takes me to run from the spring to the

shore, for there is heaviness and vast heat, down faster and unlike—Pain, otherwise—” While he was speculating over the lad’s unwillingness to complete the concept—there had been a definite downward inflection to the root tones that meant refusal to elaborate, rather than inability—the other eight children broke from the spell that had held them.

Abandoning their spears, they turned almost as one, and struck out for the strip of sandy beach a hundred feet away.

And Ted Jepson got his second shock that day. An even nastier one than the first, for the youngsters were not employing their usual frantic dog-paddling. Each swam true and swiftly, with graceful economy of energy: The Australian crawl!

And in the thirty-some seconds it took them to reach the shore, Ted realized his professional career was over. No need, even, for the authorities to get out their scope needles, for the island children had copied his style perfectly—that odd, loose-legged kick that had helped him place second in the 1992 Olympic fifty-meter events.

A correspondence school detective could easily sew up the case.

But as the children dragged themselves across the sand and melted away into the thick foliage of the Tournefortia grove, it occurred to Ted to wonder why they had not shown off their new accomplishment before. It was New Year’s Eve he had gone

topside, swimming out through the submarine locks and up to an isolated strip of beach. And this was September. Why hadn’t they been seen practicing the stroke? And why wait to use it? If they had delayed this long, maybe there was a chance they’d not do it again for a while—for long enough for him to build an alibi, plan a defense.

He’d have to hide the disk, of course. As a scientist the realization gave him a few sharp moral twinges, but as Ted Jepson who had to eat it wasn’t so much.

The intercom buzzed as he reached to shut off the recorder. Guiltily, he snatched away his hand and flicked on the box. “Jepson,” he said.

“Radar,” shouted the other. “Chavez in Radar. Hey, I’m tracking something in at hundreds of miles an hour, maybe thousands. It looks as if—”

With an impact that shocked the little coral island to its last polyp bud, something smacked into the lagoon and began to roar. The view screens showed nothing but clouds of boiling vapor.

Ted found his voice before the other did. “You were saying?”

“Yeah! What was that?” The radar man’s words were hardly audible above the thunder from the speakers. Ted turned them down. “I was saying,” went on Radar—a noticeable shake in his voice—that whatever

it is, was, might hit the island. Where did it land?"

"In the lagoon. Whatever it was it was mighty hot. Water's boiling up there. Did you get pictures of it?"

"Hope so. We started filming the second it pipped. Wanna' wait till they're here?"

Ted told him he would. Taking off the disk of the incriminating Australian crawl exhibition, he slipped it under the duty log and loaded up the recorder again. With both of them going, he began getting shots and sounds of the excited islanders as they hurried from whatever they'd been doing to line the lagoon shore.

"Still there?" asked Radar.

"Sure."

"Meteorite! Big chunk about the size of a football. Black and kind of knobby. Got some good pictures," he said proudly. "Sell 'em to *Life*, mebbby. 'Bye."

The steam clouds were lifting from the water, and Ted could make out pieces of what he supposed was boiled octopus floating on the surface. It had been quite a day, he mused wryly.

Taking up a pen, he began to brief the incident for the log, but a face detached itself from his memory and floated down over the page. The face of a small blond boy, his gaze upturned to the sky. And he had said something . . . something oddly important.

Ted tapped the pen thoughtfully against his teeth, and the boy's words came drifting back: ". . . Heaviness and vast heat. Down faster . . . pain . . . from this spot we go—"

Hot and heavy and fast: The meteorite! And the lad had spoken of it at least three minutes before it hit!

Ted laid the pen carefully down on the console and wet his lips. Cautiously, and with nice control, he allowed the impossible fact into his familiar scheme of things. Then he entered the picture and studied it for a place in which the new data might fit.

An hour later he discovered it wouldn't fit at all, but that it had managed to twist the familiar scheme into a beauty of a maze. He gave up and began to stride angrily around in his maze.

The stars burned hotly against the velvet midnight sky when he broke surface.

For long minutes he rested, floating, filling his aching lungs again and again with the rich salty air, and letting the ground swells carry him closer to the breaker line. When a comber finally humped itself beneath him, he began swimming it, lashing the luminous plankton into a frail pinkish glow like the one marking the shore. Suddenly he was with it, sliding down the long black slope, then fighting for air in the churning white thunder when the wave



broke.

Wearily, Ted dragged himself up from the backrush and onto the narrow shelf of beach. In the bright starlight it looked just as it had that New Year's Eve; three or four-hundred square feet of sand, bounded on three sides by sheer, overhanging rock walls, and on the fourth by the restless Pacific.

A blind spot. Inaccessible except from the ocean, and under water at high tide. Not worth a mike and an eye.

There were five other blind spots on the island.

One of them had to have a lot of answers hidden in it, or Dr. Ted Jepson would rapidly become the world's most unpopular man.

He leaned against the cliff and rested. Water trickled from the pockets of his shorts. It was a forlorn gamble, he supposed, but what else could he do? Such an important dis-

covery as an apparent precognitive ability in those nine island children had to be studied. It was not in him to keep silent about it. But to demonstrate their wild talent would also be to show them swimming like a certain ex-Olympic champ. And he would have to tell of getting drunk at the tech's New Year's brawl, and feeling an almighty desire for a swim; of sneaking out through the submarine tunnel—no mean feat!—and up through twenty-five feet of surging ocean to this isolated beach. Scared sober by then and dreading the even more dangerous return trip, he had nevertheless put in an hour of long-wanted exercise.

And he had obviously been observed.

Choosing the least precipitous cliff, Ted began the climb, searching by touch for handholds on the spray-wet rock, pulling himself slowly upward by sheer strength. It took him a quarter of an hour to make the ascent.

With scratched and bleeding fingers, he dragged himself over the lip of the cliff and peered down at the island beyond. The first non-islander on the spot in thirty-six years.

It was a dubious honor, he reflected dourly—like being the first man to paint a goatee on the Mona Lisa.

Shedding himself of his sandals and muddy shorts, he ditched them in some bushes and set off naked down the hill. With his dark lamp-tan and sinewy build there was a fair chance of his being taken for an islander if spotted by some over-alert tech. Knowing the location of the eyes and mikes gave him better odds, he hoped, and the man on night duty in the View Room usually kept on only those screens that showed the village and its nearby paths. Not that he'd be any worse off if spotted.

Of course, he mused dryly, picking his way through a heavy stand of coconut palms, he could always *stay* topside. It was unlikely that they'd send a posse after him. He could hole up in one of the blind spots and maybe become a sort of god to the islanders.

But he remembered the children in the lagoon who had looked three

minutes into the future . . .

Punk material for worshipers.

The first blind spot he entered gave him a mild surprise. In what had been thought to be a solid tangle of bamboo and breadfruit trees, Ted found a tiny rectangular lake, made by someone's damming up the leg of a stream. Investigation proved it to be as wide across as he could reach, up to his shoulders in depth, and about twenty paces long.

Quite adequate for practicing the Australian crawl.

But why? Why should the islanders, so enviously free of superstition and legislation, take such pains to hide the activity? Were the kids forbidden by their elders to use such a swimming style, and had they built this spot to outwit the oldsters?

A flimsy supposition at best.

He gave it up and left the thicket. It was brighter now. From the western oceans a half moon had swum above the horizon, and with it came a freshening breeze that bore the scent of wood smoke and jasmine. Ted struck off through the shadows for the second spot on his itinerary, a quarter of a mile away.

Nature had caused this one: The disastrous typhoon of '78 which had killed twenty of the islanders had torn from a hillside one of the "boulders" with its eye and mike setup, and had hurled it into the sea, wires and all. The area it had scanned was conse-

quently lost, of course—a triangular half-acre of grass and rocks, crossed by two paths. Since then, by careful observation, the top brains of the project had deduced that the area was unchanged and as unimportant as ever.

Ted came to an abrupt halt as he entered the rough meadow.

The top brains, he observed, had made an impulsive deduction. Where the paths had once intersected sat a huge sphere of glass and dull metal. Two rods protruded from a band about its middle, and to an opening between them led a flight of four or five steps.

He crept to within ten yards of the thing before its purpose dawned on him. After thinking carefully for a few minutes, surprised at his own calmness, he backed cautiously away.

The tide was in when he reached the cliff so he didn't bother to climb down. He jumped. Five minutes later he was within the island, clinging weakly to a submarine's mooring line. Another five sufficed to see him into Dr. Finley's austere quarters.

Ted began at the beginning, with the confession that the island children had learned the crawl from himself. The graying director of Project Peace reacted about as Ted had imagined: With anger—controlled, but contemptuous. Ted accepted the man's bitter rebuke without reply.

Lean and dignified in his robe and sandals, Dr. Finley paced over to a

frosty carafe of water and poured himself a drink. "And I gather, Jepson, from the condition of your clothes, that you've been topside just now."

"Yes, sir."

"Why? Why did you see fit to jeopardize the project again?"

"I went up because the islanders have at least nine children among them capable of precognition. There's a sight-sound record in my quarters proving they knew of the meteorite's coming at least three minutes in advance. Shall I get it for you?"

Finley looked away, sipped his water in silence for a time. "Not now," he said thoughtfully. "I'm inclined to believe you. Something of this sort happened years ago. I was in the View Room and saw a youngster run in panic from beneath a cliff two hours before it gave way and fell." He put down the glass, lighted a slender cigar. "All right, Jepson. What did you expect to find topside? Something to vindicate yourself?"

"That's hard to say, sir. I suppose I hoped to, but I was looking more for something that would answer a lot of questions. I knew it would be my last chance."

Finley's tufted gray eyebrows pulled together quizzically.

"I mean things like their language, sir. Their music. Their impossibly splendid ethics. The air of sophistication and assurance to everything they do." The explanation sounded lame and inadequate even to Ted. Grimly,

he continued. "Call it curiosity, maybe, but I was going to have a look in those blind spots."

They eyed each other for long seconds, Finley drawing thin blue smoke from his cigar, and Ted beginning to itch beneath his wet clothing. The director finally spoke, his voice sardonic. "Find anything?"

"I did. In sector twenty-seven, a grove of trees, there is a hidden trough of water. Large enough for the children to have learned to swim in."

Finley frowned, studied the fine ash at the tip of his cigar. "You're certain it wasn't a natural formation?"

"Quite. There was a stone dam."

"Hm-m-m." Finley rolled the cigar carefully between his fingers. "Any ideas about it?"

"No, sir. Not yet." It was petty of him, Ted knew to drag this out so.

"Anything else?"

"Yes."

"Well, dammit?"

"At sector thirty-five, blind since '78. There's a spaceship just inside the zone."

Ash fell from the director's cigar onto the rattan carpeting. "Ridiculous, Jepson. The U.N. hasn't lost any craft. They're either in Arizona, Australia, or trying to get past the Moon. And, besides, if one had fallen, Radar would have spotted it. What gave you —"

"Excuse me, Dr. Finley, but this wasn't any ship of ours. It was small, just about fit into this room. It floated

six inches off the ground. The grass around it was trodden down, and something that might be a folding chair stood nearby. I say it's a spaceship with some sort of gravity drive. It wasn't built on this planet. And I suggest you get some pictures of it quick."

Dr. Finley set about relighting his cigar as if nothing of importance had been said. From behind a cloud of smoke he shot Ted a swift and hard gaze. "You sober, Jepson?"

"Of course."

"Too bad. Maybe there is something up there." He threw the cigar into a huge pottery tray and stalked angrily about the room.

Ted couldn't figure it. One of the most momentous events in Earth's history had occurred, and Finley expressed displeasure. He asked the older man about this.

"Don't you see, son? If you're correct in your assumptions, it spells the end of Project Peace. The islanders have undoubtedly been in contact with this . . . this visitor. What good are they to us now as a study of mankind? We're on the eve of discovering how to live with ourselves . . . maybe only two or three generations from it, and suddenly the stars are in our backyards. We're not ready? We're no more ready for space than we were for the printing press, or for atomics. We're savages, trying to discover how the islanders live in peace and in

happiness, adjusted to their environment. It's too soon, Jepson. Too soon by at least a couple of hundred years."

"You forget one thing, sir," Ted told him quietly.

"What?"

"The islanders undoubtedly know of him, as you said. And he undoubtedly knows of us. But they're giving no more indication of that knowledge than they gave of knowing how to do the crawl. Why haven't we heard them talking about that great globe? Why aren't they up there gathered around it, squatting on their haunches wondering about it? *How long has it been there?*

In silence, old Dr. Finley mulled over what Ted had said.

Three minutes later he picked up his phone and called the submarine commander from his bed. "Captain, I'm sending a man down to pick up a pair of swim fins and a Cousteau lung. He's under my orders. Chap by the name of Jepson. Thanks."

He called Stores. "I want a waterproof transceiver. Sound and sight. A small one, hand size. Technician Jepson will be over in a few minutes to pick it up. Good-by."

He turned to Ted, studied him bleakly. "You realize my position, I suppose. If there's nothing up there . . . I'm sending *you* because you've already been seen by the islanders. It hasn't made an observable impact on them, aside from the swimming business. So there's no use showing them

another man." As he began getting into his clothes, he explained that Ted was to keep the two-way open from the moment he touched land topside. He was not to establish contact with the sphere — that was strictly a U.N. affair — but was to send a close-up of it, then back off up into the hills and hide the transceiver, aiming it to send images till it ran down. "All right, son. Get to it."

An extremely curious group of men were on hand at the sub docks to see him off. They helped him into the swim lung, assisted him in buckling on the rubber fins over his sandals, and after Ted had clambered awkwardly down into the dark lapping water, handed him the transceiver.

"Bring me back a blonde," shouted one of the sailors from the sub. His words echoed strangely in the stone and water vault.

The lung and the fins made it simple going, despite the two-way's drag. Once outside, and surfaced into the pale moonlight, Ted made for a better landing spot than the isolated beach. He had no intention of ever scaling those rock walls again, so he swam a few hundred yards down the coast and put in on a high reef of coral that formed a rough, natural jetty. Pulling himself carefully up over the sharp incrustations, he scrambled ashore and unfastened the lung from his chest. This and his swim-fins he ditched in the profuse undergrowth and turned

on the two-way. When Dr. Finley's face and shoulders glowed into the dollar-sized screen, sunk into the set's butt end, Ted told where he was and checked reception.

Then he turned inland, oddly self-conscious as he passed before the hidden eye and mike units, each time resisting the impulse to thumb his nose or grimace into them. Nerves, he guessed. He was pretty highly keyed. He forced himself to take it easier.

Reception, both sight and sound, faded completely away as he neared the blind spot. Ted thought it over, then backed out and checked when the worried-looking Finley reappeared.

"You faded, too," said the director. "Some sort of natural blanket, you suppose?"

Ted didn't think so. "Let me go in closer, sir," he whispered. "Maybe it'll lift closer in. If it's from the ship, it's bound to have a sort of umbrella effect, or his stuff wouldn't work, either." He began to move forward while Finley chewed that over with one of the electronics men. The blanketing *could* have a central no-zone, he supposed, but there was no telling how close. Thirty feet from the ship? A yard?

He entered the meadow.

It was still there. But now a light burned within it, a soft and faintly greenish glow, like the low flare from an early cathode tube. Something about it served to impress upon Ted the absolute alienness of the ship. His

skin prickled uncomfortably as he considered a few of the grimmer possibilities: Hard radiations, for one. Should have brought a counter. Extra-terrestrial germs. Should have — He ran a hand over his mouth. Should'a stood in bed.

A glance showed the transceiver still dead. He moved in closer, tempted by the craft's great windows and the half-seen objects within.

"Hello," said a mild tenor voice behind him. In English.

Ted whirled, automatically hefting the mass of the two-way.

"Peace," continued the voice. "And speak island?"

He came forward from the pool of shadow cast by a boulder. A human, Ted saw with relief, clad like himself in shorts and sandals. No, not quite human . . . taller, more slender, and with huge black eyes almost twice the size of Ted's own. But decently humanoid. Thankfully, he put aside all worries of intelligent fungi, frog creatures, and other Sunday supplement spawnings.

"That is yours?" He indicated the alien ship.

"Yes. An old model, but one to which after long years of use I have become attached. It gets me there."

Ted took a long breath and asked the question. "Where?"

"Back and forth. To this planet from others unknown to you. My home is in another star system. One

nearer the center of the galaxy." He stepped closer, an effortless grace to his movements that suggested his accustom to greater gravities than Earth's. "May I compliment you on your composure?"

Ted made the palm up island gesture that meant acceptance, acquiescence. The motion caught the other's notice. "I tried to make them quit that. Semantically," he used the English word, "it's too broad. By the way, I am called Eren Tu."

"Jepson." He swallowed with difficulty. "Ted Jepson. You tried to what?"

"I tried to teach the motion away. Gave them nicer variations, if they must supplement their conversation with visual signals. Gesturing is a trait of your communication about which we know relatively little. While quite familiar with your printed languages, we found it more difficult to study the meanings of winks, salutes, shrugs, and the like. Your films and Earth to Moon broadcasts are helping, however."

Weakly, Ted spoke the island word expressing utter bewilderment and requesting immediate explanation.

"I can appreciate your emotions, friend. Suppose we sit over there on the grass and make ourselves comfortable." He led the way. "And if you have been worrying about my communicating a sickness to you, don't. Our races have a common origin and although we have evolved with slight

differences, we are *basically compatible. Many meetings prior to ours have proven this."

Dazed, Ted sat. "Go slowly for me, Eren Tu. There have been other meetings?"

Many times, he was informed. Eleven hundred Earth-years since the first routine reconnaissance and contact, the visitors from space had, on their periodic checks, learned our languages and sat with our finest minds in attempts to comprehend our bewildering culture.

"But why was there no record of such contacts. Surely—"

"Will you be believed, Ted Jepson? Besides, those we sought out were wise enough to recognize the impossibility of Earth's being accepted into Galactic society." It was a rule, he explained, that races had to measure to certain minimum standards.

"Such as?"

A recognition and acceptance of the literal immortality of individual personality. That was grounds for automatic membership. A peaceful, yet technically advanced people could enter, if their dominant philosophies contained no dynamically dangerous errors. Or if a race possessed certain extraordinary talents, peculiar to themselves, but which could be beneficially used by others, they might be acceptable.

"And Earth?"

Eren Tu studied Ted's face a moment before replying. "Earth pos-



sesses quite a little of all the eligibilities, but not enough, I fear, to offset its inherent danger to a delicately ordered Galactic confederacy. Can you guess what that is?"

Without too much reflection Ted spoke. "Our warlike nature?"

"That is but a manifestation of your illness. You are made frustrate and angry, and driven to your wars because you have such poor tools for thinking and for communicating with each other. That is why we tried. That is why I have been here, off and on, for over ten years. I am a language instructor, one of several, who have taught the islanders a simple form of the tongue spoken by everyone in civilized space."

There was a long pause during which Ted noted the other had an extra joint on each thumb. Not that it mattered greatly. He was far more perturbed by what Eren Tu had said. As a philologist and student of semantics he recognized the truth of the other's statement. Humans never had managed to communicate more than fractionally with each other. And, as they thought almost entirely with words, how could their very concepts be worth much? Envy and its inevitable animosity tugged him as he regarded the large-eyed, vaguely sympathetic features of Eren Tu.

"And what if we just came barging into your exclusive society without the invitation?"

The other smiled, a grave wise smile. "That will not happen."

Correct again. Ted thought bitterly of the countless attempts, in the last twenty-five years to get a ship farther than the Moon. Something always went wrong. All electrical equipment would fail; cosmic radiation increased capriciously, dangerously; strange vertigoes assailed the crews. Let them play at voyaging between Earth and Moon, but beyond—Discourage them.

"I'm sorry," Eren Tu told him.

Stop them like the mad dogs they were.

"In time, perhaps, Ted Jepson," he suggested softly.

Two or three thousand years, maybe, when they'd evolved a language to help them out of kindergarten. A language—

"But the islanders have taught many of us to speak your tongue! It's being taught in several of our universities. If we were told that's all we had to do—learn the language—we'd all do it."

"In time, perhaps," he said again. "You see, it is one of the basics of Galactic civilization that we tell no one how to mature. That is something a people must do for themselves."

"But why," Ted asked, "did you come to the island and set up school?"

For the first time, Eren Tu frowned. "We became impatient," he said. There were certain attributes and talents native to Earthlings, he explained, which would be valuable.

Earth's unique sense of humor, for one. It was needed to freshen and revitalize certain other races. To lend its peculiar nutrition to a great stellar group grown somber and static with age.

An infusion of Earthlings was also longed for because they alone of the humanlike peoples possessed a great number of latent extrasensory abilities. "To say nothing of your tremendous natural energies and drive," he added. "When word was received that this Project Peace, as you term it, existed, there were certain liberal factions who maintained it would not be a violation of observational codes to teach the subjects, the islanders, our tongue—after first conditioning them not to speak of us within hearing of your microphones. In that way, Earth could do what it wished with the language, could mature if it pleased. And while, as you say, thousands of your people are studying to speak it, there has been no discernible change in their natures. Wars still threaten to involve them. Greed and anger and other suicidal tendencies are increasing, instead of lessening. Even you, Ted Jepson, who can talk with me as well as the islanders, have an aura tainted with violence. Why, I cannot say. It is probably something in your heritage which not even semantic correction can touch."

"But the islanders," put in Ted, puzzled.

"Yes. The islanders have reacted as

we had hoped you all would. They are stable and loving and just. But they know no other language, you see. They have always *thought* in it."

Ted plucked a blade of grass and chewed its tender stem thoughtfully. It was as bitter as his mood. What a perfect vicious circle: We can't get in because we're not invited. We're not invited because we're antisocial. We're antisocial because of our clumsy thought and speech processes, and they'll stay clumsy because we can't get in. "You've wrecked Project Peace, too, you know. Maybe we could have made it without your . . . help."

"You are compensated for our interference. You have the language. A fair trade."

Ted shrugged. "Perhaps. And what about these poor devils? The islanders? What have they got?"

Eren Tu looked for a long moment in the direction of the village. "That is being debated by my superiors. There are some who hold we should wipe out all memory of our visits. Others want them taken from the island and admitted as special wards to our society. Word of their decision should reach me any hour now. An important happening was predicted for tonight, and I don't believe your coming was meant."

"Predicted?"

"Yes, Ted Jepson. I spoke of your race's extrasensory abilities. Appar-

ently certain areas of the islander's brains were activated by the proper semantic processes. That has happened in nonhuman specie. All manner of mental talents have been demonstrated when the thinking has been properly changed. You realize," his tones became self-deprecating, "I'm speaking as a layman. That isn't my field. At any rate, after warning me that the technician who taught them to swim was coming up—"

Something extremely ironic dawned on Ted. "They know of the project?"

"Certainly. They've always known of it."

Ted's laboring mind turned up a wry memory; a scrap of joke about the researcher who bent down to peer in at his laboratory ape, only to find an inquisitive brown eye at the other side of the peephole. "Go on," he said wearily.

"They look only so far into the future. The distance seems to depend not only on the individual but on the nature of the event. It varies—a few hours, at the most. Beyond that they say the pictures are blurred and often inaccurate, colored, I suppose, with imagination." Eren Tu broke off, appeared to be listening intently. Then he sprang to his feet and peered down the grassy slope into the darkness.

Someone was coming. Ted heard them now, too.

The islanders! And they were singing. A soft, happy song, filled with humor and expectation that was often

sung before a celebration. It served to remind Ted of a question. "By the way, I suppose not even their music is *theirs*?"

Without looking away from the oncoming crowd, Eren Tu admitted that an early visitor had carelessly underestimated the islander's hearing ability, and had allowed his craft's communication set to play too loudly. "That song they're doing now is based on a melody popular twenty years ago in my star system. It's a distinct improvement on the original, though."

They were closer now, and Ted could see that in keeping with their song, they had bedecked themselves with gay garlands of flowers. Even the vanguard of scampering children wore blossoms of jasmine in their hair. He began to recognize individual members of the party: "Old" Emo, with the coral scars about his rugged shoulders. Nea, the girl he had watched when he came on-duty. The small blond lad who had given the first warning of the meteorite. Crippled Tumo, the young spear maker. And over three hundred others in a long singing, laughing file that wound down and out of sight into the darkness of the valley.

Quite a turnout for a couple of hours before dawn.

Why?

Doc Finley and the techs on duty in the View Room must be having fits, Ted imagined. Probably think the islanders have come to greet me. Surreptitiously he checked the screen

on the two-way. Still dark.

He hoped someone would have guts and presence of mind enough to sneak a cameraman out and up into the hill-top nearby. If the world had proof of Eren Tu's visit—

• But then what? A soul-corroding frustration at being left out, unwanted?

The first of the children came up to them now. They formed a ragged ring about the two men; shy, giggling, or wide-eyed, according to their natures. Ted's gaze sought out the little blond youngster who had starred in the lagoon episode. "Hello, son," he smiled. "I'm Ted. I've forgotten your name."

"Lute. What's the matter in your head?"

"Huh?" Ted's hand went to his hair. "In? Or on?"

The child made a disapproving sound. "You sit wrong." Leaving Ted to chew this over, he turned to watch his elders arrive. A tall Latinish man, one of the original "children," Ted recalled, greeted Eren Tu cordially.

"Your happiness is mine," Eren Tu observed, taking in the growing crowd with his eyes. "This is the important happening that was foretold?"

"Yes." The dark islander walked abruptly over to Ted. "We will become good friends," he said. It was not a question, nor a command. Simply a statement. He looked earnestly across at Eren Tu. "He sits in the wrong place, doesn't he."

Ted's head began to ache. "That's

the second time it's been mentioned. Explain, please." He pressed his temples.

"Ted Jepson," called the man from the stars excitedly. "They tell me your men from below will be coming out of the hilltop."

"That's right," added the tall islander. "I have seen only a little of it, and I could not tell when it would take place, but Lute and Nea and others of the young ones say it will be very soon. It will be after you have taken up that object"—he pointed at the two-way—"and speak into it."

"But he can't do that," protested Eren Tu. "I have something in my ship that prevents it."

"You will soon turn it off."

"Why?" The alien's gravity and composure was wearing a bit thin.

"Because he—" the islander gestured to Ted—"will soon learn something."

Never had Ted had such a headache. And as with most extremely healthy people, the minor ailment was worrying him. With only part of his attention had he been following the bewildering conversation about him. Most of his concern was centered on the fingers of fire that were darting between his temples. He wondered if it could be a pressure-head from the underwater swim. Or maybe a nasty fungus from the ship, despite its owner's assurances? Through eyes that were beginning to water he made out the boy, Lute, confronting him. "My

father," he announced gravely, "wants us to talk."

"Sure, boy." Ted massaged the back of his neck.

"I told him how it was that I saw you sitting wrong, and he said for me to have you sit better. It is part of what will happen, I can see now."

Ted was quiet, baffled, and more than a little frightened. He dimly noticed that late arrivals to the scene were hoisting up their children so that they might not miss anything.

"Maybe I'm beginning to understand." Eren Tu had come over. "They have been telling me you do not think correctly. They say you operate your thoughts from the wrong place. There is an asleep area to your mind that, apparently, they can see. Does it mean anything to you?"

Ted struggled: They knew of the emergency exit that could be blasted open atop the island's highest hill. They were expecting him to make a call to Finley with the two-way. How did that tie in with his headache, with an "asleep" area of his mind?

"Let the boy, Lute, do what he wants," said Eren Tu.

Ted dug at his temples with his knuckles. "All right, kid, it's your show."

"I'm sorry it aches," said the boy. "That's because it was asleep and we all looked at it. But it will be over in a moment." A serious frown of concentration tugged at his brows. He gazed

up into Ted's eyes and began giving him certain curious instructions, the very formulation and expression of which were possible only because of the fluidity and precision of the island language. Ted was made to partially blank his mind and to let the sensation of pain settle into a particular area. When it had coalesced and steadied down, Lute gave him what amounted to the form and dimensions of his identity-extensions. A corner of his thoughts found time to rebel in admiration: Orthodox mind science would probably have gone on missing the simplicity that was the essence of individual identity for a thousand years.

Ted moved this concept of his identity into the spot designated by the pain. He settled himself there and withdrew utterly from the old seat of operations.

The pain vanished. And with his smile of pleasure came an indescribable mixture of emotions; peace was there, but it was a thrilling and dynamic thing, not placidity. A strength and courage such as he had never before known seemed his now, and a burning desire to use this vigor to live and to experience and to be.

He was in love. With everything.

"Don't you see," he shouted at the bewildered Eren Tu, "I'm whole, I'm well, I'm as I was probably intended to be. I'm like the islanders!" Song broke out around him as he told what had happened. "This is what my

planet's religious men have been trying to speak of. But without knowing it for themselves, and without a language to teach it, they made it into a soggy, revolting piety. This is *love*, and I'm operating *from it*!"

"Can others of you make the change-over?"

"Why not?" Ted grabbed the grinning blond lad to him and tousled his hair. "Certainly. Anyone that speaks island tongue. There are thousands of us. More every month. Tell him, Lute."

Nea came up and gave him flowers for his hair. A mighty, grinning Chinese put a garland around his neck. Each peered intently at Ted, then nodded reassurance at Eren Tu.

The man from the stars had allowed blossoms to be thrust over each ear. His holiday appearance contrasted comically to Ted with his dubious and uncertain air. He shook his head. "Apparently there's only one way of finding out for sure. If they make the change—" He turned for the ship, muttering something about unprecedented procedure.

The sky was lighter now, and the night wind was softening into a fragrant breeze. Ted faced into it and looked up at the morning stars. He was smiling at a particularly bright one when the set came alive.

"Hello, Project," he said. "This is Jepson. Come on up, all of you. There's going to be the damndest sunrise you ever saw."

THE END



CRAZY JOEY

BY MARK CLIFTON AND ALEX APOSTOLIDES

There's nothing wrong with being a telepath; the trouble is it's maybe a little crazy to let people know it.

Illustrated by van Dongen

Joey pulled the covers up over his head, trying to shut out the whispers which filled the room. But even with the pillow over his head, their shrill buzz entered up through the roof of his mouth, tasting acrid and bitter, spinning around in his brain. Fingers

in his ears simply made the words emerge from a sensation of cutting little lights into words.

"It worries me, Madge, more and more, the way that boy carries on. I was hoping he'd outgrow it, but he don't."

His father's voice was deep and petulant, sounding from the pillow on his side of the bed there in the other room. "Hanging back all the time. Not playing with the other kids, staying out of school, claiming the teachers don't like him. It ain't natural, Madge. I don't like it."

"Now you're working yourself up again, Bob," his mother's patient voice from her side of the bed cut across the deeper tones. "What good is it going to do you?"

"Did some good when I thrashed him," his father spoke sharply, and a little louder. Joey could hear the buzz of the voice itself coming through the walls. "Stopped him talking about whispers. I tell you I ain't gonna have a kid of mine acting crazy. I passed a bunch of the little brats on the way home tonight. 'There goes Crazy Joey's father,' I heard one of them say. I won't stand for it. Either Joey learns to stand up and be a real boy, or—"

"Or what, Bob?" his mother's voice had both defiance and fear in it.

"Or . . . oh, I don't know what—" his father's voice trailed off in disgust. "Let's go to sleep, Madge. I'm tired."

Joey felt his mother's lift of hope. Perhaps she could keep awake a little longer, waiting for his deep breathing to assure her he was asleep, so she could move from her extreme edge of the bed and be more comfortable—without touching him.

The deep, rasping sensation of his father's weary hopelessness; desire,

but not for her. Drab and uninteresting. He was still young enough, still a man; tied down tight to this drab.

The lighter, more delicate thought of his mother. She was still young enough, still hungered for romance. The vision of a green slope of hill, starred with white daisies, the wind blowing through her flowing hair, a young man striding on firm brown legs up the hill toward her, his sloping shoulders swinging with his stride. Tied to this coarse hulk beside her, instead.

The heavier rasp of thought demanded attention. Those girls flouncing down the hallway of the school; looking out of the corners of their eyes at the boys; conscious only of the returning speculative stares; unconscious of the old janitor who was carrying baskets of wastepaper down the hall behind them.

Joey buried his head deeper into the bed beneath his pillow. The visions were worse than the whispers. He did not fully understand them, but was overwhelmed by them, by a deep sense of shame that he had participated in them.

He tried to will his mind to leave the visions, and there leaped, with startling clarity, the vision of his father holding him down on the bed, a terrible rage in his face, shouting at him.

"How come you know how I looked at those two girls in the hall at school? You spying little sneak!" The blows.

The horror. The utter confusion.

And the imaginings were worse than the visions. So clear, so intricately clear, they became memories. Memories as sharp and clear as any other reality. Eight-year-old Joey could not yet know the reasoned verbalization: An imaginary experience can have as profound an effect upon personality development as a real one. He knew only that it was so.

But he must never tell about this beating, must never tell anyone. Others wouldn't have any such memory and they would say he was crazy. He must store it away, with all the other things he had stored away. It was hard to keep remembering which were the ones others could remember, and which were his alone. Each was as real as the other, and that was the only distinction.

Sometimes he forgot, and talked about the wrong things. Then they called him a little liar. To keep away from that he always had to go into their minds first, and that was sometimes a terrible and frightening thing; their memories were not the same as his, and often hard to recognize.

Then it was morning. The whispers were all about him again. In half awake reverie, he shuddered over the imagined beating he had received. He twisted and turned under the covers, trying to escape the also twisting threads of thought between his father and mother in the kitchen. The

threads became ropes; gray-green and alive; affection turned resentment coiling and threatening; held back from striking only by hopelessness. He stared into the gray morning light seeping in around the shade at his window. He tried to trace the designs on the wallpaper, but they, too, became twisting worms of despair. And transferred again into the memory of the beating. Involuntarily, a sob escaped his throat, aloud.

"Madge!" this was no whisper, but his father shouting at his mother. "That kid is in there sniveling again. I'll give him something to bawl about." The sudden terrible rage was a dead black smothering blanket.

"Bob!" the sharp fear in his mother's voice stopped the tread of feet across the kitchen floor, changing the rage back to hopelessness.

He felt his father go away from his door, back to his place at the table. He felt the sudden surge of resolution in his father.

"Madge, I'm going to talk to Dr. Ames this morning. He gets in early. He's the head of the psychology department. I'm going to talk to him about Joey."

Joey could feel the shame of his father at such a revelation. The shame of saying "Dr. Ames, do you think my son is crazy?"

"What good will that do?" his mother's voice was resentful, fearful; afraid of what the doctor might say.

"I'll tell him all about Joey. He

gives loony tests, and I'm going to find out about—"

"Bob! Saying such a thing about your own son. It's . . . it's sinful!" His mother's voice was high, and her chair creaked as she started to move from her side of the table.

"Take it easy, Madge," his father warned her. "I'm not saying he's crazy, mind you. I just want to get to the bottom of it. I want to know. I want a normal boy." Then desperately, "Madge, I just want a boy!" The frustration, the disappointment welled over Joey as if it were his own.

"I'll talk to the doctor," his father was continuing, reasoning with her. "I'll try to get him to see Joey. I'm janitor of his building, and he shouldn't charge me anything. Maybe he'll see you and Joey this afternoon. I'll call you on the phone if he will. You be ready to take Joey up there if I should call." The voice was stern, unbending.

"Yes, Bob," his mother recognized the inflexibility of the decision.

"Where's my lunch pail, then?" his father asked. "I'll get to work early, so I can have a talk with Dr. Ames before class time."

"On the sink, Bob. Where it always is," his mother answered patiently.

The sudden rage again. Always is. Always is. That's the trouble, Madge. Everything always is. Just like yesterday, and the day before. That's why it's all so hopeless. But the bitterness switched suddenly to pity.

"Don't worry so, Madge," there

was a tone of near affection in his father's voice. Belated consideration. Joey felt his father move around the table, pat his mother awkwardly on the shoulder. But still the little yellow petals of affection were torn and consumed by the gray-green worms of resentment.

"Bob—" his mother spoke to the closing door. The footsteps, heavy, went on down the back steps of their house, each a soundless impact upon Joey's chest.

Joey felt his mother start toward his room. Hastily he took the pillow from over his head, pulled the blanket up under his chin, dropped his chin and jaw, let his mouth open in the relaxation of deep sleep, and breathed slowly. He hoped he could will away the welts of the belt blows before she would see them. With all his might he willed the welts away, and the angry blue bruises of his imagination. All the signs of the terrible consequences of what might have been.

He felt her warm tenderness as she opened his door. Now the lights were warm and shining, clear and beautiful, unclouded by any resentments. He felt the tenderness flow outward from her, and wrapped it around him to clear away the bruises. He willed back the tears of relief, and lay in apparent deep sleep. He felt her kneel down by his bed, and heard the whispers in her mind.

"My poor little different boy. You're

all I've got. I don't care what they say, Joey. I don't care what they say." Joey felt the throb of grief arise in her throat, choked back, the tremendous effort to smile at him, to make her voice light and carefree.

"Wake up, Joey," she called, and shook his shoulder lightly. "It's morning, darling." There was bright play in her voice, the gladness of morning itself. "Time all little fellows were up and doing."

He opened his eyes, and her face was sweet and tender. No one but a Joey could have read the apprehension and dread which lay behind it.

"I sure slept sound," he said boisterously. "I didn't even dream."

"Then you weren't crying a while ago?" she asked in hesitant puzzlement.

"Me, Mom? Me?" he shouted indignantly. "What could there be to cry about?"

The campus of Steiffel University was familiar to Joey from the outside. He knew the winding paths, the stretches of lawn, the green trees, the white benches nestled in shaded nooks. The other kids loved to hide in the bushes at night and listen to the young men and women talking. They snickered about it on the school playground all the time. Joey had tried it once, but had refused to go back again. These were thoughts he did not want to see—tender, urgent thoughts so precious that they belonged to no one

else except the people feeling them.

But walking up the path now, leading to the Psychology Building with his mother, he could feel only her stream of thought.

"Oh I pray, dear God, I pray that the doctor won't find anything wrong with Joey. Dear God . . . dear God . . . don't let them find anything wrong with Joey. They might want to take him away, shut him up somewhere. I couldn't bear it. I couldn't live. Dear God . . . oh dear God—"

Joey's thought darted down another bypath of what might be, opened by his mother's prayer. He willed away the constriction in his throat.

"This is interesting, Mom," he exclaimed happily. "Pop is always talking about it. But I've never been inside the building of a college before. Have you?"

"No, son," she said absently. Thank Heaven he doesn't know. "Joey—" she said suddenly, and faltered.

He could read the thought in her mind. Don't let them find anything wrong with you. Try not to talk about whispers, or imagination, or—

"What, Mom?" it was urgent to get her away from her fear again.

"Joey . . . er . . . are you afraid?"

"No, Mom," he answered scornfully. "Course not. It's just another school, that's all. A school for big kids."

He could feel his father watching them through a basement window, waiting for them to start up the steps

of the building. Waiting to meet them in the front hall, to take them up to Dr. Ames' study. He could feel the efforts his father was making to be casual and normal about it all; Bob Carter, perhaps only a janitor, but a solid citizen, independently proud. Didn't everyone call him Mr. Carter? Recognize his dignity?

Joey's father, with his dignity upon him, met them at the doorway of the building; looked furtively and quickly at the rusty black clothing of his wife, inadvertently comparing the textiles of her old suit to the rich materials the coeds wore with such careless style.

"You look right nice, Madge," he said heavily, to reassure her, and took her arm gallantly. When they had reached the second floor, up the broad stairs, he turned to Joey.

"I've been telling the professors how bright you are, Joey. They want to talk to you." He chuckled agreeably.

Pop, don't laugh like that. I know you're ashamed. But don't lie to me, Pop. I know.

"Just answer all their questions, Joey," his father was saying. "Be truthful." He emphasized the word again, "Truthful, I said."

"Sure, Pop," Joey answered dutifully; knowing his father hoped he wouldn't be truthful—and that his mother might die if he were. He wondered if he might hear the whisperings from the professors' minds. What if he

couldn't hear! How would he know how to answer them, if he couldn't hear the whispers! Maybe he couldn't hear, wouldn't know how to answer, and then his mother would die!

His face turned pale, and he felt as if he were numb; in a dull dead trance as they walked down the hall and into a study off one of the big classrooms.

"This here is my wife and my son, Dr. Martin," his father was saying. Then to Joey's mother. "Dr. Martin is Dr. Ames' assistant."

The boy is very frightened. The thought came clearly and distinctly to Joey from the doctor's mind.

"Not any more," Joey said, and didn't realize until it was done that he had exclaimed it aloud in his relief. He could hear!

"I beg your pardon, Joey?" Dr. Martin turned from greeting his mother and looked with quick penetration into Joey's eyes. His own sharp blue eyes had exclamation points in them, accented by his raised blond brows in a round face.

"But of course he is Dr. Ames' assistant," his father corrected him heartily, with an edge behind the words. You little fool, you're starting in to demonstrate already.

That isn't what the boy meant. Dr. Martin was racing the thought through his mind. I had the thought that the boy was frightened, and he immediately said he wasn't. All the pathological symptoms of fright disappeared

instantly, too. Yes. Put into the matrix of the telepath, all the things Carter told us this morning about him would fit. I hadn't considered that. And I know that old fool Ames would never consider it.

If there ever was a closed mind against ESP, he's got it. Orthodox psychology!

"We will teach nothing here but orthodox psychology, Dr. Martin," Ames had said. "It is the duty of some of us to insist a theory be proved through time and tradition. We will not rush down every side path, accepting theories as unsubstantial as the tobacco smoke which subsidizes them."

So much for ESP. Well, even Rhine says that the vast body of psychology, in spite of all the evidence, still will not accept the fact of ESP.

But if this kid were a telepath—a true telepath. If by any chance he were—If his remark and the disappearance of the fear symptoms were not just coincidence!

But another Ames' admonition dampened his elation. "Our founder, Jacob Steiffel, was a wise man. He believed in progress, Martin, as do I. But progress through conservative proof. Let others play the fool, our job is to preserve the bastions of Scientific solidity!"

"Dr. Ames has not arrived yet," he said suddenly to Joey's parents. "He's been called to the office of the University president. But, in the mean-

time, leave the boy with me. There's preliminary work to do, and I'm competent to do that." He realized the implications of bitterness in his remark, and reassured himself that these people were not so subtle as to catch it.

"I got work to do anyhow," Joey's father said. His relief was apparent, that he would not be required to stand by, and he was using it to play the part of the ever faithful servant.

"Here's a room where you may wait, Mrs. Carter," Dr. Martin said to Joey's mother. He opened a door and showed her in to a small waiting room. "There are magazines. Make yourself quite comfortable. This may take an hour or so."

"Thank you, doctor." It was the first time she had spoken, and her voice contained the awe and respect she felt. A thread of resentment, too. It wasn't fair; some had so many advantages to get educated. Others—But the resentment was drowned out in the awe and respect. These were not just ordinary doctors. They *taught* doctors!

She sat tentatively on the edge of a wooden chair, the hardest one in the room. The worn red feather in her hat drooped, but her back remained straight.

Joey felt the doctor thinking, "Relax woman! We're not going to skin him alive!" But he merely closed the door. Joey could still see her sitting there, through the closed door; not

relaxing, not reaching for a magazine. Her lips were pulled tight against her teeth to keep her prayer from showing. "Dear God, oh, dear God—"

Dr. Martin came back over from closing the door, and led Joey to a chair near the bookcase.

"Now you just sit down there and relax, Joey. We're not going to hurt you. We're just going to visit a little, and ask you some questions." But his mind was darting in and out around his desires. I'd better start in on routine IQ tests, leave the Rorschach for Ames. Now that it's standard, he'll use it. Leave word-association for him, too. That's his speed. Maybe I should give the multiphasic; no, better leave that for Ames. He'll discredit it, but it'll make him feel very modern and up-to-date to use it. I mustn't forget I'm just the errand boy around here. I wish I could run the Rhine ESP deck on the boy, but if Ames came in and caught me at it—"

The office phone rang, and Martin picked it up hurriedly. It was the president's office calling.

"Dr. Ames asked me to tell you he will be tied up for almost an hour," the operator said disinterestedly. "The patient will just have to wait."

"Thank you," Martin said slowly. Joey felt his lift of spirit. I can run a few samples of the Rhine cards. I just have to know. I wish I could get away from this place, into a school where there's some latitude for research. I

wish Marion weren't so tied down here with her family and that little social group she lords it over. "My husband is assistant to the Dean of Psychology!" That's much more important to her than any feeling I've got of frustration. If I quit here, and got into a place where I could work, really work, it would mean leaving this town. Marion wouldn't go. She's a big frog in a little puddle here. And still tied to her parents—and I'm tied to Marion. If anybody needs psych help, I do. I wish I had the courage—

Joey, as frequently with adults, could not comprehend all the words and sentences, but the somatic indecision and despair washed over him, making him gasp for breath.

Martin went over to a desk, with sudden resolution, and from far back in a drawer, he pulled out a thin deck of cards.

"We're going to play a little game first, Joey," he said heartily, as he sat down at his desk and pulled a sheet of paper toward him. "There are twenty-five cards here. Five of them have a circle, five a star, a wavy line, a cross, a rectangle. Do you know what a rectangle is, Joey?"

Joey didn't, but the vision of a square leaped into his mind.

"Yes, sir," Joey said. "It's a sort of square."

"That's right," Martin said approvingly, making a mental note that the boy shouldn't have known the word, and did. "Now I'm going to

look at a card, one at a time, and then you guess what kind of an image there is on it. I'll write down what the card really shows, and what you say it is, and then we'll see how many you get right."

Too short a time! Too short a time! But maybe long enough to be significant. If I should just get a trace. All right, suppose you do? The question was ironic in his mind. He picked up the first card and looked at it, holding it carefully so that Joey would have no chance to see the face of it.

A circle leaped with startling clarity into Joey's mind. And the circle contained the image of Joey's mother, sitting on the edge of her chair in the other room, praying over and over, "Don't let them find anything wrong with him. Don't let them find—"

"Square," Joey said promptly. He felt the tinge of disappointment in Martin's mind as he recorded the true and the false. Not a perfect telepath, anyway.

"All right, Joey," Martin responded verbally. "Next card."

"Did I get that one right?" Joey asked brightly.

"I'm not supposed to tell you," Martin answered. "Not until the end of the game." Well, the boy showed normal curiosity. Didn't seem to show too much anxiety, which sometimes damped down the ESP factor. He picked up the next card. Joey saw it contained a cross.

"Star," he said positively.

"Next card," Martin said.

It was in the nineteenth card that Joey sensed a new thought in Martin's mind. There was a rising excitement. Not one of them had been correct. Rhine says a negative result can be as revealing as a positive one. He should get every fifth card correctly. Five out of the twenty-five, to hit the law of averages. Martin picked up the twentieth card and looked at it. It was a wavy line.

"Wavy line," Joey answered. He felt the disappointment again in Martin's mind, this time because he had broken the long run of incorrectness.

The twenty-first card was a star.

"Star," Joey said.

And the next three were equally correct. Joey had called five out of the twenty-five correctly, as the law of averages required. The pattern was a bit strange. What would the laws of chance say to a pattern such as this? Try it again.

"Let's try it again," he suggested.

"You were supposed to tell me how I did at the end of the game," Joey prompted.

"You were correct on five of them, Joey," Martin said, noncommittally.

"Is that pretty good?" Joey asked anxiously.

"Average," Martin said, and threw him a quick look. Wasn't that eagerness to please just a bit overdone? "Just average. Let's try it again."

This time Joey did not make the

mistake of waiting until the end of the deck before he called correct cards. The doctor had said every fifth card should be called correctly. Joey did not understand statistical language. Dutifully, he called every fifth card correctly. Four wrong, one right. And again, the rising excitement near the twentieth card. Again, what are the laws of chance that the boy would call four wrong, one right, again and again, in perfect order?

Joey promptly called two of them right together. And felt Martin's disappointment. The pattern had been broken again. And then a rise of excitement, carefully suppressed.

"Let's run them again," Martin said. And he whispered strongly to himself. "This time he must call every other one of them right, in order to pass as just an average boy."

Joey was bewildered. There seemed to be a double thought in Martin's mind, a tenseness he could not understand. He wavered, and then doubtfully, doubting he was doing the right thing, he began to call every other card correctly.

Halfway through the deck Martin laid the cards down. Joey caught the flash of undisguised elation in his mind, and sank back into his own chair in despair. He had done it wrong.

"O.K., Joey," Martin said quietly. There was a smile of tender bitterness around his lips. "I don't know what the idea is. You've got your reasons,



and they must be pretty terrible ones. Do you think you could talk to me? Tell me about it?"

"I don't know what you mean, Dr. Martin," Joey lied. Perhaps if he didn't admit anything—

"In trying to avoid a pattern, Joey, you made one. Just as soon as I realized you were setting up an unusual pattern, you immediately changed it. Every time. But that, too, is a pattern." And then he asked, quite dryly, "Or am I talking over your head?"

"Yes, sir," Joey said. "I guess you are." But he had learned. The whole concept of patterned response as against random response leaped from Martin's mind into his. "Maybe if I tried it again?" he asked hopefully. At all costs he must get the idea out of Martin's mind that there was anything exceptional about him. This time, and forever afterwards, he knew he could avoid any kind of a pattern. Just one more chance.

"I don't blame you, Joey," Martin answered sadly. "If you've looked into my mind, well, I don't blame you. Here we are. You're a telepath and afraid to reveal it. I'm a psychologist, supposed to be, and I'm afraid to investigate it. A couple of fellows who caught the tiger by the tail, aren't we Joey? Looks as if we'd better kind of protect one another, doesn't it?"

"Yes, sir," Joey answered and tried to hold back the tears of relief. "You won't even tell my mother? What about my father?" He already knew

that Martin didn't dare tell Ames.

"I won't tell anybody, Joey," Martin answered sadly. "I've got to hang on to my job. And in this wise and mighty institution we believe only in orthodox psychology. What you have, Joey, simply doesn't exist. Dr. Ames says so, and Dr. Ames is always right. No, Joey," he sighed, "I'm not likely to tell anybody."

"Maybe he'll trick me like you did," Joey said doubtfully, but without resentment. "Maybe with that inkblot thing, or that 'yes' and 'no' pile of little cards."

Martin glanced at him quickly.

"You're quite perfect at it, aren't you?" He framed it a question and made it a statement. "You go beyond the words to the actual thought image itself. No, Joey, in that case I don't think he will. I think you can keep ahead of him."

"I don't know," Joey said doubtfully. "It's all so new. So many new things to think about all at once."

"I'll try to be in the room with you and him," Martin promised. "I'll think of the normal answer each time. He won't look very deep. He never does. He already knows all the answers."

"Thank you, sir," Joey said, and then, "I won't tell on you, either."

"O.K., Joey. We'd better be finishing the IQ test when he comes in. He's about due now. I suppose you'd better grade around a hundred. And you'd better miss random questions, so as not to show any definite pattern, for

him to grab on to. All right, here goes. Tell me what is wrong with this statement—”

The tests were over. Joey sat quietly in his chair, watching Dr. Martin grade papers at his desk, watching him trying not to think about Joey. He watched his mother in the waiting room, still sitting on the edge of her chair, where she had been for the last two hours, without moving, her eyes closed, her lips still drawn tight. He watched Dr. Ames, sitting in his own office, absently shuffling papers around, comparing the values of the notes he had taken on Joey's reaction.

But the nearer turmoil in Dr. Martin's mind all but drowned out the fear of his mother, the growing disgust of Dr. Ames.

“It's a choice between Joey and holding my job. No matter how secretly I worked, Ames would find out. Once you're fired from a school, it's almost impossible to get a comparable job. All this subversive business, this fear of investigating anything outside the physical sciences that isn't strictly orthodox. No matter what explanation was given out, they'd suspect me of subversion. Oh Marion, Marion! Why can't I count on you to stand beside me? Or am I just using you as an excuse? Would I have the courage even if there were no Marion?”

He rubbed his hand across his eyes, as if to shut out the vision of a world

where there was no Marion. He replaced it with a world where constant fear of becoming grist for some politician's publicity ground all research to a halt. He had quite forgotten that Joey was sitting across the room, and could follow at least the somatics of his thought.

Consciously he shoved the problem into the background, and made himself concentrate on the words of the student's paper before him. The words leaped into startling clarity, for they were a reflection of his own train of thought.

“... it becomes apparent then that just as physical science varies its techniques from one material to the next to gain maximum result; psychology must obtain an equal willingness to become flexible. I suggest that objective physical science methodology will never permit us to *know* a man; that such methodology limits us merely to knowing *about* a man. I suggest that an entirely new science, perhaps through somatics and methodology derived therefrom, must be our approach.”

Dr. Martin shoved the paper away from him. Must warn that student. His entire train of thought was a violation of orthodox psychology. Ames would crucify the boy if he ever saw this paper. Did he dare warn the boy? Students show so little caution or ethics. He could hear him now down at the milkshake hangout.

“Martin told me to soft-pedal my thinking if I wanted to get a grade.”

And the answering chorus from all around the room, the Tannenboum chant.

"Oh, Steiffel U will stifle you,
We all must think as granddads do!"

Best just to give the student a failing grade on the paper, and let him draw his own conclusion. Got to be orthodox.

With his thumb and fingers he pulled the flesh of his forehead into a heavy crease, grinding it between his fingers, taking pleasure that the pain of the flesh lessened the pain of his spirit. If only the kid had never shown up here!

His thought stream was interrupted in Joey's mind by the scene now taking place in the waiting room. Dr. Ames had taken a chair beside Joey's mother.

"Oh no, no, no, no, Mrs. Carter," he was saying consolingly. "Don't be so frightened. There's absolutely nothing wrong with your boy. Nothing at all—yet. I've never tested a more average boy."

Characteristically, he had overlooked the most vital point, a point also forgotten by Martin when he was thinking of the proper answers for Joey to give—that no boy can possibly be as average as Joey had graded. It never occurred to him that mean average is a statistical concept in psychology, never to be found in one individual.

"Notice I said 'yet,' Mrs. Carter," Ames said heavily. "He's an only child, isn't he?"

"Yes," Joey's mother barely breathed the word. Her fear had not abated. She knew that doctors sometimes did

not tell all the truth. In the soap operas they always started out comfortingly, and only gradually let you know the terrible truth.

"I thought so," Ames said with finality. "And as with many one-child families, you've spoiled him. Spoiled him so dreadfully that now you must take stern measures."

"He's all I've got, doctor," she said hesitantly.

"All the more reason why you want him to grow up into a strong, solid man. A man such as your husband, for example. A child is a peculiar little entity, Mrs. Carter. The more attention you give him, the more he wants."

He continued the development of his theme inexorably.

"Their bodies can be little, but their egos can be enormous. They learn little tricks for getting attention. And then they add to these with others. They're insatiable little monsters. They never get enough. Once they get you under their thumb, they'll ride you to death. They'll try anything, anything at all to get special attention, constant attention. That's what has happened to your Joey."

"I'm not sure I understand, doctor."

"Well, Mrs. Carter, to put it bluntly. Joey has been pretending, telling lies, deliberately keeping you worried and fearful so that you will give him more attention. He hasn't been able to fool his father so well, so in line with Oedipus Complex, he set

about to win you away from his father, to come between you. Your husband is a fine man, a good worker; but your son wants to make you turn against your husband so he will get all of your attention."

He was enjoying the development of his logic, sparing no impact upon her.

"And it could be bad for the boy. Too much attention is like too much candy. It makes them sick." He pulled an ancient trick upon her, deliberately confusing her to impress her with the gravity, and his knowledge. "If this continues, the boy could easily become a catatonic schizophreniac!"

Joey's mother shrank back, her eyes opening wide. The horror of the unknown was worse than the reality might be.

"What is that, doctor?"

The doctor, gratified by her reaction, pulled another ancient one.

"Well . . . er . . . without the proper background . . . er . . . well, in layman's language, Mrs. Carter, we might roughly define it as an incurable form of insanity."

"Oh no, no! Not my Joey!"

The doctor leaned back in his chair. In this changing world of thought anarchy, it was good to see there were some who still retained the proper respect, placed the proper value upon the words of a man of science. These flip kids he got in his classes these days; this younger generation! With-

out respect, that flip kid he'd had to get expelled.

"Just give us the facts, doctor, and let us draw our own conclusions. Yours haven't worked so well."

Yes, it was gratifying to see there were still some who recognized a man of position.

"But you can prevent it, Mrs. Carter." He leaned forward again. "Joey is eight, now. No longer a baby. It is time he began to be a little man. He plays hooky from school, says the teachers don't like him. Why, Mrs. Carter, when I was eight, I got up before daylight, did my farm chores without complaint, and walked two miles through the snow for the wonderful privilege of going to school!"

"Now here is what you must do. You must regard this just as you would a medical prescription; with full knowledge of the penalty if you do not use the prescription: You must stop mothering him. Stop catering to him. Pay no attention to his tricks. Let his father take over, Mrs. Carter. The boy needs a strong man's hand."

"He must be forced to play with the other boys. A black eye never hurt a boy, now and then, a real boy. Your boy must get in there and scrap it out with the rest of them, gain his place among them, just as he will have to scrap later to gain his place in society."

A sigh, almost a sob, escaped her. A doctor knows. And this doctor *teaches* doctors. Relief from tension,

fear of the terrible words the doctor had said; and then a growing anger, anger at herself, anger at Joey. He had tricked her. Her son had lied to her, betrayed her love, pretended all sorts of terrible things just to worry her. She stood up suddenly, her face white with grief-rage.

"Thank you, doctor. Thank you so much. I'm sorry we took up your time." Her humiliation was complete.

"No thanks needed, Mrs. Carter. Glad to help. We've caught it in time. If it had been allowed to go on a little longer—"

He left the phrase hanging in the air, ominously. He patted her arm in a fatherly fashion, and turned absently away, dismissing her.

Joey saw her open the door into the room where he was sitting.

"Come, Joey," she said firmly.

Dr. Martin did not look up from the papers he was now grading with furious speed, furious intensity, slashing angrily with his blue pencil at any thought variant from the orthodox. But even while he checked, circled, questioned, the thought crept into his mind.

"I could write an anonymous letter to Dr. Billings of—Yes, that's the thing to do. It's out of my hands then. If Billings chooses to ignore the follow-up, that's his business."

Joey followed his mother out of the room and down the hall. She walked ahead of him, rapidly, her eyes blazing with anger and humiliation, not

caring whether he followed her or not.

In one corner of the schoolyard, the boys were playing ball. Joey knew they saw him coming down the sidewalk, alone, but they pointedly paid no attention to him.

He did not try to join them. Even though they were not looking at him, he could hear the hated refrain singing through their minds.

Crazy Joe
Such a schmo!
Hope he falls
And breaks his toe!

It was simply their resentment because he was different. Their unconscious wish that he stumble and fall now and then, as they did. He realized that he must learn to do this. Then he shrugged. No, if he carried out his plan, it wouldn't matter.

He walked on down past the fence of the play yard. The boys were concentrating on their ball game.

Without a warning a warmth suffused him, singing sympathy, hope, joy. He stopped, looked about him, and saw no one. Yet the somatic feeling had been near — so very near.

Then he saw it. A dirty, lop-eared dog looking at him quizzically from under a shrub near the playground gate. He thought at the dog, and saw its head come up. They stood and looked at one another, each letting the warmth, the tenderness, affection wash over them. So lonely. Each of them had been so lonely.

Joey knelt down and began to whisper.

"My mother is mad at me right now. So I can't take you home."

The dog cocked his head to one side and looked at him.

"But I'll get food for you," Joey promised. "You can sleep under our back steps and nobody will know if you just keep out of sight."

The dog licked a pink tongue at his face. Joey nuzzled his face in the dirty hair of the dog's neck.

"I was going to die," he whispered.

"I was going to die just as soon as my mother got over being mad at me. I was going to wait until then, because I didn't want her to blame herself later. I can do it, you know. I can stop my blood from moving, or my heart from beating; there's a hundred ways. But maybe I won't need to do it now. I won't need to die until you do. And that will be a long time; a long, long time. You see, if I can stop your heart from beating, I can keep it beating, too."

The dog wagged his stumpy tail; and then stiffened in Joey's arms.

"Yes," Joey thought quickly at the dog. "Yes, I know the kids are watching us now. Pretend like —" the thought hurt him, but he said it anyway. "Pretend you don't like me, that you hate me."

Slowly the dog backed away from Joey.

"Here, doggy, doggy!" Joey called.

The dog gave a wavering wag of his stump tail.

"No, no!" Joey thought desperately. "No, don't let them know. They'll want to hurt you if they find out. They're — People are like that."

The dog backed away another step and lifted his lip in a snarl.

"Yah! Yah! Yah!" the kids called out. "Joey can't even make friends with a dog!"

They were standing in a semicircle about him now. Joey stood up and faced them then for a moment. There was no anger or resentment in his face. There never would be now. One just shouldn't get angry at blind and helpless things.

Without a word he started walking down the street, away from them. The dog crouched far back in the corner under the shrub.

"Yah! Yah! Crazy Joey!" the kids called out again.

Joey did not look back. They couldn't see. They couldn't hear. They couldn't know. He felt a rush of pity.

The kids went back to their play, arguing loudly about who was at bat.

The dog waited until their attention was fully on the game again. Then he crept out from under the bush, and started ambling aimlessly down the street in the direction Joey had gone, trotting awkwardly on the bias as some dogs do.

He did not need to sniff for tracks. He knew.

THE END



THE REFERENCE LIBRARY

BY P. SCHUYLER MILLER

OFF THE CUFF . . .

In recent columns, it seems to me—and to certain of our readers—I've been using too much space to make important-sounding pronouncements on this and that. This month, for a change, I'm going to answer the mail.

This, I'm sorry to say, is something that doesn't happen very often in the way that it should—directly. But I'm the world's worst correspondent in any case, and I do manage to get loaded down with other things. There are months when I have to stay up overtime to read anything *but* the four or five books for the "Library."

However . . .

A good few of the recent letters which have reached me raise a question which is apparently widespread: "How do I go about buying a book?" It takes various forms: I've been asked to buy them for a reader, to give the publisher's full mailing address, and even to present the review copy to the individual who says he'd like to read it too. Actually, I had no concept of the problem it might be for the average person to get his hands on a good book, until I came here and found that I have to hunt all over Pittsburgh for each new issue of the current science fiction magazines. But

that's another story.

Let's tackle the easy things first, namely how one goes about finding out what science fiction books are in print, from what publishers and at what prices. This need take you no further than your nearest public library.

One of the librarian's chief tools is a monthly paper-bound book, collected into a bound volume at the end of each year and at intervals of several years, known as the "CBI"—"Cumulative Book Index," published by H. W. Wilson Company of New York, the great indexers of everything and anything. The CBI tries to index all books and many pamphlets in English, published anywhere in the world. It hits all the major publishers, but naturally misses some privately published items for the simple reason that the publisher-author never sends a copy for indexing.

As of January 1953 the CBI has a special heading for "Science fiction." Under it you should find all science fiction listed in that particular volume, by author's name. Checking back to the author, you get full information on publisher and price—and publishers' addresses are in the back of the book.

What about old titles? If you know author or title, you can run down the rest of the story in the back volumes of the CBI—then it's time to use another library tool, the "Publishers' Trade List Annual" and its index,

"Books in Print." The latter, under author or book-title, tells you immediately whether the book you want is still in print—that is, whether it can still be obtained from the publisher or has gone on an old-book or rare-book basis. The big two-volume trade list then gives the rest of the information, under publisher. It's a mighty good way of finding books you may never have suspected are still in print at the original price . . .

Your library should let you use these reference books, if you're a responsible individual. Sometimes a bookstore will. And then? Well, you *can* send the list price directly to the publisher at the address in the CBI. But, if there's one anywhere around, I plug for your local bookseller. It won't cost you any more—maybe less, if the publisher is one who charges postage and handling on direct orders—and if someone is going to make a few cents out of the book, it ought to be a man who makes publishing possible.

And right here comes the squawk about price—why do we have to pay so much for books, when they're reprinted for a quarter?

The answer is, you don't—relatively speaking. If the price of books had gone up proportionately to other living-cost items, you'd be paying four and five dollars for science fiction that is at or under three dollars. Actually, according to the president of McGraw-Hill, the average list price of novels has gone up only twenty-six

per cent in twelve years, non-fiction up only thirty to forty per cent.

Believe me, the cost of printing and distributing a book *has* gone up. The printing trades are among the best paid in the country. A survey that is now six years old reported that between 1942 and 1947—five years—the cost of paper had risen thirty-seven to forty-five per cent, the cost of linotyping—machine setting of the type for the book—was up seventy-seven per cent, the cost of binding was up fifty-eight to sixty-one per cent. A publisher who could once get his money back—still no profit—by selling twenty-five hundred copies of a book now has to sell ten thousand or more.

Books are more of a luxury than tobacco, liquor, or betting on horses so far as the American people are concerned. Among other things, they accumulate whereas cigarettes or a fifth of bourbon vanishes overnight. The evidence of your "extravagance" is right there to haunt you. At any rate, people won't—you won't—pay much if any more than you are for the best book going. The cost of publishing it is way up—the sales price isn't. What happens?

First, the publisher, the bookseller, and the author are all sharing the squeeze. The publisher *may* be in the toughest spot—but he takes the gamble of losing money on a dozen small editions of just-so-so books

(including his science fiction list) in order to keep his standing as a leading publisher, and hopes he can make it up on one big best-seller that goes to a book club. Because nowadays he splits book club and other subsidiary income with the author—paperbacks, motion pictures, TV, and all the rest.

Writers have also been cut back in royalties, offset a little by the bigger editions of today—if they sell out. By and large, except for runaway best-sellers full of sex and violence, a writer gets a good deal more from a magazine sale than from the same story in book form.

The bookseller is really in between. Time was when he got a forty per cent discount from the list price of "trade" books—less for textbooks and technical books. Now that's true only if he places a big order—and only some big-city bookstores can afford to stock very many copies of a title which they may not be able to sell. He *may* make only thirty, twenty-five or fifteen per cent on a three dollar book. And out of that he has to pay his employees, the landlord, the taxes, insurance, and keep enough to give himself and his family a decent living.

Ideally, every bookstore would buy a few copies of every new book—at least, every new science fiction book—for customers to look over. Practically, anyone who tried it would go broke but fast. So you have to size up the reviews, try to get your library to buy the thing, and eventually, if you're

willing to take a chance on the combination of author, publisher, reviewers and all the rest, ask the bookstore to order the book for you. (Even then, he can do it only by ordering from a wholesaler who won't insist that he has to buy five copies to get one—if he wants a decent discount.)

I'm not saying there aren't discount sources for the average reader. Use them if you can: we all need to get all we can for our money. But they have a way of not lasting very long.

Why can one publisher put out a book for twenty-five cents when another charges three dollars? Because the paperback is a reprint. The actual plates from which the original edition was printed—electrotypes, hard metal plated from the original type which would be too soft to last for more than a few hundred copies—may have been rented or bought by a second publisher, at a nominal price, *after* they have been paid for by the sale of the first edition. No cost for typesetting, makeup, proofreading, corrections—the original publisher absorbed all that, and earned the book a reputation to boot. Most hardbound reprints can be published at reduced cost because the cost of manufacture is cut by renting plates. And book club selections (which are actually reprints) go out at cut rate for the same reason—so that the harassed bookseller has to pay more for a book *wholesale* than his customers do retail from a book club!

With the paperbacks (except for the new Ballantine experiment, described elsewhere in this issue, of printing a paper and hardbound edition simultaneously), type usually has to be reset and plates made, but the binding cost is way down, the overhead is distributed over an enormous edition and hence cut to a few cents per copy, and the writer gets along with about a cent-per-copy (four per cent) in royalties. Paperback books are essentially reprint magazines which stay on the stand until the drugstore proprietor is sick of seeing them and sends them back, or until the distributor replaces them with something sexier.

Now we're beginning to get some original paperbacks, good, bad, and indifferent. For reading, they're fine, but they won't hold up so well on the library shelf. Maybe the Ballantine scheme is the answer: one to read, one to keep. But I'd hate to see hardbound books pushed out of existence. . . .

* * *

One other question: a reader wants a book which will tell him "everything about astronomy"—descriptions of the planets, distances of the stars, laws of motion, everything.

I do too. I find that the trend even in texts is toward the descriptive and general: I'm still looking for a text in print that contains enough mathematics so that I can calculate the direction of Earth from Mars on April

27, 2253. Books on theories of the evolution of planetary systems and galaxies are coming thick and fast, and we've reviewed some of them. But that general book. . . .

The best I've seen is "Pictorial Astronomy," by Dinsmore Alter and Clarence H. Clemminshaw of Griffith Observatory, Los Angeles (Thomas Y. Crowell Co., New York. 1952. 296 pp. \$5.00—it came out at \$4.50 and has gone up). Needless to say, it's illustrated to the hilt, with some superb astronomical photographs and scores of clear, simple drawings. It won't tell you "everything," but it gives you more than any other book of its kind that I know. I'm only sorry I didn't discover it before the price went up—on my copy as well as yours.

STAR SCIENCE FICTION STORIES,
edited by Frederik Pohl. Ballantine
Books, New York. 1953. 206 pp.
\$1.50; paper, 35c.

Ballantine, a new publisher with courage and imagination, is having a go at the problem of bringing book prices down without going broke. The technique: simultaneous publication of a paper-back edition and a hardcover edition—by Ballantine or some other publisher—in a large enough combined print-order to bring the unit cost down. It's been tried before: let's hope this time it works.

Science fiction is definitely in the Ballantine scheme, with three books

scheduled and more to come. The first is an excellent collection of original short stories selected by and written for the author-editor-agent, Frederik Pohl—co-author of the second BB title, "The Space Merchants," which is out as you read this.

There are fifteen stories in the book, whose contents page runs like a roll-of-honor of the best current magazines. Most of them are good, some of them stand out.

One of these is the opening yarn, William Morrison's "Country Doctor," in which a veterinarian on Mars has to get *inside* his patient to find out what's wrong. It is one of the best of the "old-fashioned" problem tales of situation. Then there is Fritz Leiber's outrageous satire on Mickey Spillane's detective stories, "The Night He Cried." And I liked John Wyndham's "The Chronoclasm," a time-twister, the irony of William Tenn's "The Deserter," and Arthur C. Clarke's outré "The Nine Billion Names of God," in which a computer invades secret Tibet. . . .

The old business of seeing the future and growing rich is the theme of C. M. Kornbluth's "Dominoes," one of the minor items in the collection. Lester del Rey's "Idealist" is a wry little tale of one man in war, not unlike "The Deserter." Clifford D. Simak has a neat gadget story in "Contraption," H. L. Gold replaces the gadget with the gimmick of a man whose senses reverse in "The

Man With English," and Ray Bradbury uses time to his own good ends in "A Scent of Sarsaparilla."

From Judith Merrill we have a characteristically human story of a wife who must stay behind when her husband goes to Mars, "So Proudly We Hail." Isaac Asimov uses the mechanistic approach to romance in "Nobody Here But . . ." From Robert Sheckley it's a not too original commentary on man and Martians, "The Last Weapon," while "Lewis Padgett" fissions into Henry Kuttner and C. L. Moore to do "A Wild Surmise," a rollicking twist on psychoanalysis and dreams which belongs right in there with the best. Then Murray Leinster has a very human little episode about a boy in space, "The Journey."

Even without the Ballantine prices, this would be a good anthology—and remember, it's all brand new.

JUDGMENT NIGHT, by C. L. Moore.
Gnome Press, New York. 1952. 344 pp. \$3.50

This book is long overdue. Before she submerged her own striking literary personality with that of her equally talented husband, Henry Kuttner, in one or another of their joint pen names, C. L. Moore was one of the mark-setters of science fiction and fantasy. She had successfully combined the wonder and color of the Merritt era—who can forget "Shambleau?"—with the humanizing elements of the best new-trend writing.

"Judgment Night" appeared here in two parts in 1943. It is a pure adventure story of the downfall of one galactic civilization, the attempted resurrection of a second, the victory of a third, and the effects of two others—all familiar elements of space-opera, but beautifully woven together into a rich tapestry instead of being crudely silk-screened on a fluorescent necktie. The scenes in the pleasure satellite, Cyrille, especially those of its downfall, show the Moore touch at its best—which is to say, the best in romantic science fiction. Old it may be chronologically: this type of writing will never grow old when it is well done.

"Paradise Street," which follows, appeared here in 1950 under the name of "Lawrence O'Donnell"; the three other stories which complete the book are also "O'Donnell" tales. "Paradise Street" gives us, deftly told, one of the old, old problems of the frontier: what happens to the woodsman when the settlers come? "Promised Land," which follows, is one of two stories of the Thresholders—people born and bred in centrifuges, under otherworldly conditions of gravitation and atmosphere, until they can colonize those worlds without artificial aids. (You'll find space medicine experts talking about just such a scheme now.) This is pure action stuff: a young man's revolt against the Thresholder who has brought him up, for other equally abnormal folk who deserve their chance. "Heir Apparent," last

in the book, is another of the Thresholder series but deals with the struggle for domination between two men from the mental integration teams necessary to operate the complex mechanisms of the future.

In between is "The Code," a strange near-fantasy on the theme of living backward. In less skillful hands it might not hold water, but the glamour thrown over and around the process—using "glamour" in its old sense of a mystical mood—makes technical flaws seem unimportant.

There is one of the most striking jackets that I have seen on any recent science-fiction novel, done by Frank Kelly Freas, until quite recently of Pittsburgh. You won't understand its significance until you've finished the title story—evidence that one artist, at least, reads the books he illustrates.

MISTS OF DAWN, by Chad Oliver.
ISLANDS IN THE SKY, by Arthur C. Clarke. **ROCKET JOCKEY**, by Philip St. John. **SONS OF THE OCEAN DEEPS**, by Bryce Walton. **VAULT OF THE AGES**, by Poul Anderson. John C. Winston Co., Philadelphia. 1952. 207-216 pp. \$2.00

Since the third set of Winston science fiction novels for young people are just on the verge of appearing, it behooves me to catch you up on the second set of five—especially since these five, named above, are individually just about as good and as a lot a notch better than the first five.

As they are listed, the five books span Time from the far past (ca. 50,000 B.C.) to the far future (500 years after an atomic holocaust in our own future). They stand only one small notch below the Heinlein books as fare for both adults and teen-agers; for the latter they are recommended almost without reserve, whereas adults will find good ideas simply developed without the confusion-for-confusion's-sake of one school of current science fiction.

Mark Nye, in "Mists of Dawn," is accidentally swept back in his uncle's time-sphere to interglacial Europe, when Neanderthal men and Cro-Magnons were in conflict. The picture of life among these first of modern men to reach Europe is evidence of the author's study of anthropology, but it seems to me that he overdoes—albeit traditionally—the ogreishness of the Neanderthals. After all, in Palestine and perhaps elsewhere, the two races do seem to have interbred. I like the approach of one of Lester del Rey's stories, whose name I can't recall, much better.

Roy Malcolm outwits the sponsors of a television quiz show and wins a stay on the Inner Space Station in "Islands in the Sky." This is another of Clarke's quiet personally-conducted tours of the threshold-to-space world he envisages for a little way ahead. There is no melodrama, but as with Heinlein the plot grows out of the science of the situation and is always

related to it. Scientifically this is the best of the five, and perhaps the one most enjoyable to an adult.

"Rocket Jockey" is outrageous scientifically but oddly convincing for all that. It gives us a time when fuel conservation is of no consequence: it appears that you can jet full-tilt from planet to planet on a few gallons of the stuff. Yet, once this assumption has been made, the problems which get in the way of Jerry Blaine, teenage pilot of the *Last Hope*, are quite realistic and his solutions involve some basic astrodynamics. That the Martian villains of the piece are downright stinkers is in the good old "Rover Boys" tradition—but just such regional or planetary differences in temperament will undoubtedly develop after colonization, and the author offers convincing reasons for them.

In "Sons of the Ocean Deep," Jon West, unable to take life in space, plunges under the seas in training for Project X, a plan to relieve pressures at the bottom of Mindanao Deep and prevent a cataclysm which will slough the entire Pacific coastal belt of North America off into the bottom of the Pacific. There is fascinating detail of the undersea world, extrapolated—not too extremely—from what we now know of the deeps, and a feud with another youngster who was brought up there, both partisans obviously nursing fancied grievances. In this sense the characterization is

more real in this than in the other books in this lot, and more like the people we met in Philip Latham's "Five Against Venus."

"Vault of the Ages" is one of Poul Anderson's tales of a feudal future, five hundred years after an atomic holocaust which has wiped out our culture and driven America—and presumably the rest of the world—back to a feudal field-and-village economy. A few "witch-men" in the forbidden city ruins mine and work up metal tools and weapons: "Doctors" are witch-doctors with a little knowledge of healing and a great store of taboos based on their former understanding of what had happened. But the climate is growing colder, barbarous northerners are pressing down on the quiet farmlands of the Dalesmen, and chief's-son Carl sets out to use the secrets of a time-vault in the forbidden city for the good of his people.

These are all superior fare for young people. Plotwise they are as good as the first five in the Winston series—better than "Find the Feathered Serpent" and "Earthbound"—but the characterization seems a little poorer and the stories as a lot closer to formula in plot and treatment. Let's hope that this isn't a trend, and that Winston will continue to have experienced science fiction writers handle its science fiction for teen-agers.

THE END

THINKING IN MEN AND

It will be a lot easier to discuss thinking when we can define it; then the thing to do is to start trying, at least, for a definition!

There have been numerous articles in *Astounding* about "mechanical brains" and "machines that think." All of these have been written by engineers and/or mathematicians, with a somewhat rigorous mathematico-engineering viewpoint. Perhaps it might not be amiss to take another look at this subject, this time from the viewpoint of one who is more interested in humans than in machines.

The obvious way to start an article like this would be to ask the question, "Do machines think?" That question has been asked and answered so many times and in so many different ways that it's no longer very interesting. Let's ask some other questions, then, and see what answers we get.

What do we mean by the word "thinking"? What do machines do when they "think"? If we are willing to assume that certain activities of some machines can be called "thinking," then do men think? What are the differences and the similarities

between human and machine thinking?

One note of warning: we're *not* going to get into a discussion of machine "intelligence." In my understanding of the word, "intelligence" refers to a spectrum of activities, rather than a type of activity. We could talk about greater or lesser intelligence more cogently than we could talk about intelligence *per se*. Indeed, intelligence is a very arbitrary sort of category, with a lot of hidden assumptions; for most people, intelligence is a function limited to living beings, and it is expected of these beings that they be intelligent.

There are a lot of value-judgments pervading the concept of "intelligence" too—either you're intelligent or you ought to be ashamed of yourself. That isn't quite valid, though, for the opposite of intelligence—stupidity—has a high value in some situations. Haven't you observed how "I don't know" can save you from being saddened with an onerous task, or help you to avoid punishment?

MACHINES

BY JOSEPH A. WINTER, M.D.

In other words, thinking is the basis; intelligence has to do with the variations of that basic function. That's enough about intelligence.

We'll start off with the very obvious statement that when we refer to "machines," we are talking about devices by which man can extend his powers. A telescope, functionally speaking, is a machine to extend the power of vision; an electric motor is a functional extension of our muscles; an automobile is a machine which increases our powers of locomotion—and all of these are derived from some similar function in human beings.

In addition to such functions as seeing and muscular activity, we humans have another ability, called thinking—and we have constructed machines which can extend our powers in this process. One variety of thinking is the solving of mathematical problems—and we all know about the machines which can solve in a few hours a problem which would take years for a man to work out. Logic is another sort of thinking—and there's a machine to do that. Remembering names and addresses requires thinking, too; instead of "letting George

do it," we have built machine-Georges which are highly efficient.

Again we ask, what do computing and logic machines do when they "think"?

According to Edmund C. Berkeley, all computing machines have these functions: input, storage, computation, output and control. Input, storage and output are obvious and easily-understood functions, and probably don't need discussion; the other two functions are a little more obscure. By "computation" we mean the act of "taking in an operation *OP* on one channel, taking in two numbers *a* and *b* on two more channels, and giving out the result *c* on the fourth channel: $c = a \text{ } OP \text{ } b$." *

The "control" is the function of putting out successive orders for operation; it is also called the "programming" of the machine. "Control" receives information not only from the program-tape but also from other parts of the machine; for example, the machine may be programmed to act on the command, "If the number in

* Berkeley, E. C. "The Relations between Symbolic Logic and Large-Scale Calculating Machines." *Science*, Vol. 112; 2910:395. October 6, 1950

Register 1 is greater than that in Register 2, perform Operation 21; if not, perform Operation 22." As you can see, in order to do this the control needs to have access to Registers 1 and 2 as well as Operation Register.

Machine thinking, as of today, is of the type called *deductive*: the machine takes datum, subjects it to a generalized process, such as "add" or "multiply" or "find the square root of," and comes out with a specific answer. Deductive thinking in humans is exemplified by the process of making a diagnosis: "the patient has nausea, abdominal pain, leucocytosis, tenderness over McBurney's point; the tentative diagnosis is appendicitis."

Humans do another type of thinking, called *inductive*; in this we go from the specific to the general. To express it another way, we abstract all the similarities of a series of events, then give a general name to the class of these similarities. As an example of inductive thinking, take the problem from a test given by Heinz Werner of Clark University: "A *corplum* may be used for support; *corplums* may be used to close off an open place; a *corplum* may be long or short, thick or thin, strong or weak; a wet *corplum* does not burn; you can make a *corplum* smooth with sandpaper; the painter used a *corplum* to mix his paints. What is the meaning of *corplum*?"

This test, incidentally, is given to

children eight to thirteen years old; they usually agree that *corplum* is another name for a piece of wood.

Inductive thinking goes from the specific to the general—and, to the best of my knowledge, there is no computing machine which is used for solving problems in inductive thinking.

Now let's see how this compares with the activity we call "thinking" in men. First comes *input*; in men, we call it sensing, or perceiving, and we say that a change in the environment outside the man produces some change within the man. We have various types of nerve endings which change in function according to changes in the vibratory spectrum—or, to express this in the more usual manner, we have nerve endings which enable us to sense various parts of the vibratory spectrum. We have the tactile nerve endings in the skin, which are activated by pressure and by vibration up to five c.p.s. or so; the organ of hearing which reacts within a range of sixteen to twenty thousand c.p.s.; the heat nerves in the skin react to the infrared spectrum; the nerves of the retina of the eyes, which respond to wave-lengths in the 3900-7700^o Angstrom unit band.

The activities of our bodies also furnish a certain amount of "input." We refer, of course, to those sensory activities called "proprioception"—the means whereby we perceive muscle tonus, limb position, et cetera. These activities also fall into the category

of "control" and will be discussed there.

The process of "sensing" includes the transducing of one form of energy to another. In the human, the energy of the stimulus is changed into electrochemical energy—and, actually, these electrochemical impulses flitting around in our nervous systems make up all we know about the universe. We don't, in one sense of the word, "hear" sounds; instead, the alternate condensations and rarefactions of the air which we call sound-waves are changed by the eardrum and the bones of the middle ear into reciprocating linear motion; this motion is in turn changed by the cochlea into nervous impulses, which cause the nervous system to function in the manner called "hearing." Incidentally, in doing this the eardrum moves about 0.000000001 cm. (10^{-9})

We should also point out that sensing is, to some extent, an active process; we can choose what we will sense or not. Persons who are hypnotized can have the acuity of their senses either markedly increased or diminished; whether these changes are in the sensing or the interpreting part of the thinking process is a moot point.

Machines in thinking depend upon the function called "storage"; in the human we call this process "memory." Machine memories are stored on punched cards or tapes, or on magnetic

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tapes, or in a mercury tank or some such device. As yet, we don't know where human memories are stored; memory might be a function of all cells or of neurones or of the synaptic junctions between neurones. It might even be possible that a memory is stored as a distortion of a protein molecule; the molecule, after being distorted by a stimulus-force, reacts differently than it did before having been stimulated, and this difference in reaction leads to memory.

The work of Dr. Wilder Penfield, the neurosurgeon, gives us some clue to the location of memory; during brain operations done under local anesthetic, the touching of certain areas of the brain produced recollections of past events of the patient's life. We might say that part of the memory process lies in the brain—but what about the separate sensations which are combined to produce a recalled event? Where are they stored? Are they stored as patterns or as separate bits of information which can be combined into numerous patterns?

I suspect—and this is admittedly speculative—that we store both the elements of an experience—the sights, sounds, smells, tastes, et cetera—and the combinations of these elements. Perhaps, as the work of Penfield indicates, the combinations are stored in the brain; it might be that the elements of memory are stored in the tissues that took part in the reaction

which was experienced.

All of us have, potentially, much more memory capacity than is ordinarily believed. Investigations of hypnotized subjects have shown that highly circumstantial accounts of events which occurred in early childhood—less than six months of age, according to Lindner—can be “recalled”; the quotation marks are used to indicate that we cannot be certain of the validity of these recollections. People under hypnosis are, by definition, in the state wherein they have a strong desire to please the hypnotist; perhaps these “recollections” are imitations of how a child might act.

And yet some work with hypnosis is confirmable, and even shows that it is not necessary for us to be conscious—whatever that means—in order to store memories. An experimenter spoke words into the ears of a series of patients who were unconscious as a result of head injuries; after they had recovered, he hypnotized them, and was able to recover the words given them.

We might note, in passing, that the state of hypnosis does *not* add anything to a person's inherent abilities. In the state of hypnosis there is merely an increase in the operability and manipulability of a normal function. It should follow, therefore, that anybody can do, willfully and while wide-awake, the things which he can be directed to do while hypnotized. This would include controlling the

heart rate and the blood pressure, stopping bleeding at will, secreting from mucous membranes and, in general; having voluntary control over any of the so-called involuntary functions.

One more point about the earliness of recallable memory: the majority of the psychiatric profession seem to agree that people aren't able to recall anything which occurred to them before the age of three. However, in giving a mixture of thirty per cent carbon dioxide and seventy per cent oxygen to patients, we frequently notice that these patients behave in a manner greatly similar to that of a new-born baby. They draw up their arms and legs into the typical neonatal position and, occasionally, will cry in the manner of the new-born. Is this a sort of "memory" of one's own birth, or is it just coincidence?

In the machine, "storage" of data implies that the data is available; in there is information on a punched card, the machine finds that information. Sometimes the process of search for data is rather lengthy, but if the data is there it will be brought out. Human thinking seems to differ. Only too often we know *about* a certain bit of information, but we don't know the information; we know we have the data, but it just doesn't seem to be available. We are forced to fall back on such excuses as, "I don't remember your name but your face is familiar," or "Gosh, I've got that word right on



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the tip of my tongue, but I can't say it."

Some of the reasons for this blockage of memory, or failure to find data, are well known. If the datum is associated with something unpleasant, it's usually buried quite deeply. As an example, the other night I was trying to recall the name of a man I had met; the name did not appear, although I could recall his appearance, his voice tones, what he had talked about, all sorts of information about him. Finally I asked my wife, who told me the man's name was Payne. To my subconscious at that moment, Mr. Payne and unpleasant pain were identical and not recallable.

Computation is the next step in machine thinking; do humans have any similar function? They do—and we call it association. It seems to work like this: two percepts which occur simultaneously or sequentially become equisignificant. In other words, when we get two sensations at the same time, or when two sensations occur in 1:2 order, one sensation seems to stand for the other. They are not identical, of course, and we don't see people react to them as identities unless they're neurotic or psychotic.

Learning seems to result from this process: the child has the visual percept called "dog" and hears the word "doggy." One stands for the other; when he hears the word, he recalls the image, and when he sees the dog he

recalls its label. Or the child breaks a glass and the sound of it is followed by the pain of a spanking. In the future, the sound of breaking glass is apt to make this person feel quite uncomfortable and irritable.

When a machine computes, it relates one bit of data to another according to the functions built into it, or according to the way it is ordered to relate them. When a calculating machine relates "2" and "2," it will relate them in the manner called adding, multiplying and so on. There is a big quantitative difference between human and machine thinking in this function, because a man can relate these data in many, many more ways. "2" and "2" may also be related to "too, too divine" or "toot-toot went the whistle" or even the idea of two couples on a double date.

Another corollary of association is the process called "prediction." It can be expressed like this: "At Time One I felt Stimulus One and Reaction One occurred. At Time Two I felt Stimulus One-sub-two and Reaction Two occurred. At Time Three . . . (and so on, until a reaction occurs). Now I am feeling Stimulus One-sub-one-thousand-thirty-three; the chances are that Reaction Type One will occur. Reaction One included pain. Better I get out of here."

In other words, prediction is a process of extrapolation, and it can never be more accurate than the past data on which it is based. In fact it

can be less accurate, as in the example of the man who said that it would be easy to reach the North Pole and that no preparations for the trip were necessary. He had gone due north from New York—all the way to Albany—and encountered good weather, good roads and a restaurant every mile or so. By extrapolation he might be correct; the actuality would be an entirely different matter.

The function of prediction also influences the "output" step of the thinking process. As we predict, we also seem to mobilize energy—in the psychologist's, not the physicist's sense of the word—to make the predicted response. We see a pyramidal object painted black with the words "200 pounds" on it; when we go to lift it, we predict that it will weigh that much, and mobilize the amount of energy needed to do that much work. If we then find that it's made of balsa, not iron, and weighs two pounds, not two hundred, we have a lot of energy left over. The energy, incidentally, seems to have to come out somewhere—in this case it often comes out in anger directed at the person who perpetrated the trick, or in laughter at the silliness and unnecessary effort involved.

The process of associating, then, seems to be a factor in our ability to make graduated responses. In the language of computer-men, we can act analogically, as well as digitally. This in turn has to do with the func-

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tion we call "emotion." It is believed that when we think "intellectually" we are using our central nervous system. The units of the nervous system, the neurones, work digitally—off or on, yes or no, discharge or not-discharge.

When we react emotionally, it is believed that we are using our endocrine system; our ductless glands can secrete a little, or more, or a lot, working in an analogical manner.

Let me hasten to say that there is no such thing as a purely intellectual or a completely emotional response; we merely speak of this as a matter of convenience, recognizing that the entire body with all its functions takes part in any reaction.

We humans are capable of another type of association, then: the relating of a stimulus to an emotional state. To express this another way, we are capable of making value judgments; if we are going to perform Act A, that's going to need more energy than Act B, which means that Act A has a different value than Act B. There are numerous yardsticks for measuring value—the amount of energy expended is one, the amount of pleasure and/or pain is another, and the most widely useful parameter is survival.

Unlike machine thinking, in human thinking there is a constant process of evaluation going on with each action we take or are about to take. So far as can be determined now, most values are derived from experience,

and very few values are innate or inherited. Take the idea of the "bad smell" for example: I contend that there are no "bad smells"—there are only smells which are, or have been, associated with tissue destruction or with restriction of activity. The odor of excrement is usually associated with maternal disapproval; the odor of HC1 is associated with a change in the sensations in the respiratory passages, which are in turn associated with difficulty in respiration. Conversely, "good smells" are associated with the satisfaction—or perhaps the possibility of satisfaction—of one of the appetites. The odors of food being cooked, or the perfume used by an attractive woman would be evaluated as "good" by most men.

As you can see already, this idea of dividing thinking into arbitrary steps is artificial; it's hard to say where one process leaves off and another begins. One function cannot occur unless all the other functions are intact, and each function influences all the other functions. With the recognition of the arbitrariness of our tabulation, let's go on to the next step—"output."

In humans we call this function by such names as action, reaction or response. A stimulus has put the thinking device into a state of imbalance; the reaction tends to restore the balance.

The human has a wealth of biological devices with which he can

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respond. There are the muscles, paired and unpaired, smooth or striated, attached to bones or to skin; they may be hollow, like in the heart or the uterus; they may be tiny and numerous, like the *Arrectores pilorum*, which make the hair stand erect and give the skin the appearance of "goose pimples." A medical student learns the names of at least three hundred forty muscles; most of these muscles are paired, so we could estimate that we have around a thousand such devices for dealing with our environment.

The organs with which we make responses are also called "effectors"; to be extremely general, we could say that effectors are devices for creating differences or similarities. This creative process can be directed outwards to alter the environment, or inwards to alter the organism. The effectors for altering the environment are most often the muscles; the effectors for altering the organism—or the "in-

ternal environment" as the physiologist Claude Bernard called it—are the so-called involuntary muscles and the glands.

In other words, given a problem in the environment such as "How to cross a river," we solve the problem mostly by the use of our muscular effectors: we create changes by swimming the river or by building a bridge or a boat. Given an internal problem such as "What to do about an irritant in the bronchial passages," we solve it by coughing, by increasing the flow of mucus and so on. Actually, there are no responses which are purely outwards or inwards; the human being works as a whole, using all his effectors to some degree.

There's one thing which we humans do that we wouldn't expect a well-designed machine to do, however—and that's to try to make two opposite reactions at the same time. To be more accurate, a person often tries

to make a reaction and not make the reaction simultaneously; he starts a reaction but inhibits its completion. The act of inhibition is also a response, one which usually requires a greater expenditure of energy than a free response.

The responses which we humans make seem to be the resultants of numerous vectors of force. We might draw a diagram to illustrate what happens when you are given the stimulus "Have a highball." There would be a long arrow pointing in the direction of the drink, a short arrow pointing away from the drink, labeled "Yes, please" and "No, thank you" respectively. Between these two extremes would be other arrows of varying lengths, marked "I'm not thirsty," "It would taste good," "I should go home," "It's still early" and so on. The resultant of all these would be an arrow pointing almost at the drink, labeled "Yes—but make it a short one."

If we had all the information about any one person, I suspect that we could express graphically any sort of response he might make. It would probably require a three-dimensional graph, and it might even require the addition of the fourth dimension of time.

To return to this concept of the vectors of response—sometimes we see the forces pointing towards and away from are equally balanced. Then we see the individual frozen into impotent

immobility; or we may see him vacillate, starting a response first in one direction, then the other. When we see a person with the first condition, we say that he has catatonic schizophrenia. When a person has neuromuscular vacillation, we call it Parkinson's disease, or *paralysis agitans*. Fixation or vacillation is usually accompanied by the emotion called "fear"; when the fear-emotion-energy gets strong enough, the person is able to make a response. This is probably the rationale behind the old treatment for schizophrenia—that of lowering the patient into a pit in which there were poisonous snakes.

And so to the last of the five functions of a thinking machine—control. Humans have this function to an extent which often seems incredible; it is especially incredible if you haven't dealt with the sort of human behavior called "neurotic." All of us have "programming tapes" which represent the integrated totality of all our experiences; we were given these tapes by everyone with whom we came in contact, especially those who had authority over us during our formative years.

Every lesson which we have ever learned seems to be on our protoplasmic "tapes"—how to speak, what words are "right" to use in various situations, how to play the piano, how to make love, how to feel towards the traffic cop, the customs and conven-

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tions of our society—in short, each action we take is controlled to some extent by every experience which preceded it.

In addition to the tapes which have been punched by the experiences of a lifetime, we have control by "feedback circuits." These circuits carry the information that we have functioned, and tell us how much we have functioned. This information is fed back to the functioning organ, altering its function.

And so all this discussion brings us to a point that we've known right along—in the thinking done by men and the "thinking" done by machines there are similarities and there are differences. The obvious differences are quantitative—men have more input channels, more computing units, more output channels. There are some important qualitative differences, too; the one which is most apparent to someone with a psychiatric frame of

reference is the function of emotion. Man's possession of emotion permits him to set up a hierarchy of values, to have graduated responses, to act analogically as well as digitally—or we might even say, to act illogically as well as logically.

Another noteworthy difference between machine and human thinking is the knowledge of pain. Pain includes, I believe, both a sensation and an evaluation; the sensation seems to result from tissue destruction or from marked interference with tissue function, as is seen when a nerve is pressed upon. The evaluation of pain occurs when there is a recognition of a decrease in possible activities. Most of us seem to interpret any restriction of our activities, whether by physical force or social pressure, as somewhat painful.

The ability to perceive pain depends on nervous circuits which are of the feedback type, which tell us whether

all our organs are functioning or not. Here again we notice the ability to make a graduated response; we differentiate between mere discomfort and definite pain, and vary our responses in intensity to suit the intensity of the input.

Perhaps we could build a machine capable of registering the "pain" of improper function. But I suspect that we won't for we seem to like our machines to be uncomplaining.

And then there is the function of imagination, which in humans is manifested in dreaming, in fantasies and in creative thinking. A workable definition for imagination is: the process whereby we take one element from one experience, another element from another experience, many other elements from any number of experiences and combine these into a new pattern which we never have, and possibly never will, perceive. For example, we might take the concept of "green" from our observations of grass and leaves, and combine this with our memories of women and thereby imagine a girl with green hair.

It might be of interest to note that it is impossible to imagine anything which does not consist of familiar elements. The most bizarre BEM has eyes like some bug that we've seen, tentacles like the squid which we've seen, and he perceives by radio waves with which we're already acquainted.

I don't know of any machine which has this ability to re-shuffle the ele-

ments of its stored data. There's one machine which comes close to this function; although it's not a computing machine, I would say that it's a calculating machine—very calculating. It's the slot machine, which is so constructed as to make numerous combinations of a few simple figures. A machine with a good imagination, however, would be completely random, and a slot machine definitely isn't. I've spent a lot of money to be able to give you this information.

A simple feedback system is seen in the endocrine system: the pituitary gland secretes thyrotropic hormone, which causes the thyroid gland to secrete more thyroxin, which depresses the output of the thyrotropic hormone, thus maintaining a delicate dynamic balance. A more complex feedback circuit which includes the organs of vision and of balance, plus sensations coming from our muscles and joints, plus the nerves which actuate our muscles, enables us to stand and walk without falling over.

Besides these circuits we have the more primitive appetitive programming tapes. To use the mechanical metaphor, the appetitive circuits are those which regulate our needs for oxygen, for food and water, for elimination of waste-products and for reproductive activities. These seem to be inherent and basic; they are inescapable so long as we are alive.

If we were going to set up a heir-

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archy of programming-tapes, the appetitive circuits would have the highest priority; without them the organism would cease to exist. Next in order would come the feedback circuits, which carry the information that the appetite is satisfied, or that there are still needs which require fulfillment. Next would be the control-tapes which were created by our own experiences, and finally would come the tapes which carried the opinions and evaluations of other. Usually the more primitive circuits will override the more recently learned "tapes"; occasionally we see the opposite occurring, as when a man sacrifices his life for his principles, or when a woman starves herself into ill-health in order to have a fashionable appearance.

The discussion so far has been about the *function* of thinking in men and machines. Now let's take a quick look at the structures of these two types of

thinkers. If we consider that the neurone in the human nervous system has the same function as the relay or vacuum tube in the computing machine, we can compare the number of neurones—about 10^{10} —with the number of tubes—about eighteen thousand in ENIAC. To quote from McCulloch and Pfeiffer's paper "Of Digital Computers Called Brains" (*Scientific Monthly* December 1946), "A computer with as many vacuum tubes as a man has neurones in his head would require the Pentagon to house it, Niagara's power to run it, and Niagara's water to cool it." Not only does the human have many more vacuum-tube-like neurones, but some neurones have over a thousand connections on them, further complicating the picture.

The second big point of difference is the number of sensory nerve endings. We humans have one hundred million sensory nerve-endings in each eye, approximately thirty nerve-end-

ings for touch sensation in each square millimeter of skin, fifteen per square millimeter for cold sensation. The ear can discriminate among fifteen thousand different pitches in a range between sixteen and twenty thousand cycles per second. In addition to these are the sensory devices within the body which carry the information about the bodily state—the “strain gauges” in the muscles that tell us of the amount of tension in our muscles, the goniometers that tell us of the angles assumed by our limbs, and the constant-reading chemical analyzers which tell us of the pH of the blood-stream, the amount of blood sugar, the need for more food or water, and so on. All this information, which is constantly available to us, gives us our “self-awareness” or “sense of self.” As yet, no machine has been built with this sort of automatic self-inspection system in it.

This brings us to the last big difference between humans and their thinking machines: the function called “consciousness.” I mention this only to say that the topic doesn’t bear discussing in an article of this sort; our ignorance of consciousness is so profound that it would take several books to do justice to the subject. If we knew much about it, we could express it in a few paragraphs.

And then there are the other differences between men and machines —

the ability to move about, to search for and obtain food, to reproduce and to educate the offspring. Machines have been made which can act as if they are finding and obtaining nourishment, but we haven’t yet constructed a machine which can duplicate itself.

Perhaps some day we can build machines which will have *all* the functions of a human; would these machines then be competitors of ours? Need we fear a revolution, where the down-trodden masses of machines overthrow their human masters? Should we scrap all machines now, lest we ultimately become their slaves?

I don’t think so. It may seem paradoxical, but the more we understand about machine-thinking, the more we understand about human thinking. With greater understanding of ourselves, we will have a greater understanding of the role that our machines can play in our society—and we can insure that this role is a beneficent one. Our machines—just the plain ordinary ones, not the thinking machines—have already enabled us to increase our survival potential; isn’t there a correlation between the increasing numbers of machines we use and the increased life-expectancy of humans? If this is so, why shouldn’t bigger and better thinking machines help us to perfect our own living? Wouldn’t you like to stick around for a few thousand years and find out?

THE END

Continued from Page 8

produces. Therefore, Communism won't work." It was thrown in as a deliberate inducement to thinking and questioning of terms. Most of those who answered—some quite angrily, incidentally!—held that the flaw lay in the misuse of the terms "products" and "produces."

There's a flaw all right—but that's not it. The computer would have spotted it immediately; only we humans have difficulty in finding it.

The products of an organism are quite artificially divided into "products" and "by-products" and "waste products." As industry long since learned, a waste product is something we haven't learned a use for yet, and a by-product is a misleading term. What is the product of Street & Smith Publications, Incorporated, for instance? Street & Smith, like the National Biscuit Company, assembles

materials, packages them, and distributes them. Rumford Press, which prints this magazine, like the American Can Company, or Container Corporation, makes packages.

You hold in your hand a physical package, packed with word-structured concepts. You buy a thing of paper, ink, and metal and glue—just as you buy a thing of glass, metal and plastic when you buy a radio tube. In each case, the object is merely a package-structure for the function which you really desire.

Any organism will smother in *any* of its own products if present in excess; a waste product is one present either in excess of the usable amount, or one which is not usable.

Any organism—including the organism known as a "state" or "nation"—will smother in an excess of its own ill-regulated and ill-distributed products. The basic biological law is

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perfectly applicable to a state, or a society.

The flaw in the false syllogism is the one the computer would have spotted immediately.

"Define the term 'right'!"

This is the distributive term in the syllogism, and is so undefined as to be meaningless. The falsity of the syllogism is equivalent to that in "All men are human beings. Some human beings are mortal. Therefore all men are mortal." The flaw in that syllogism is the faulty distributive term in the second statement.

But when it comes to "right," human beings are very, very skittish indeed. They're too apt to find that some of their pet beliefs and personal preferences will be ruled out if they accept any hard, clean-cut definition of "right."

Since a machine has no rights to begin with, no beliefs, prejudices, preferences or foibles, it will most unkindly and uncompromisingly refuse to operate at all until you define what you mean by "right."

I have a deep conviction that a vastly humbled and chastened—but vastly improved!—humanity will result from the effort to teach a machine what Man believes.

The terribly tough part about it is that to do it, Man will, for the first time, have to find out exactly what he does believe—and make coherent, integrated sense of it!

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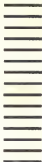
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